THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXXV. No. 2133.] LONDON, MARCH 29, 1904. [56TH YEAR. PRICE 6d.

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— *ESTABLISHED 1830.* —

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OXIDE PAINTS, OILS, AND GENERAL STORES, FOR GAS AND WATER WORKS.

SAFETY GAS-MAIN STOPPER,

FOR SHUTTING OFF GAS IN MAINS TEMPORARILY DURING ALTERATIONS AND REPAIRS.

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PRICES AND PARTICULARS ON APPLICATION.

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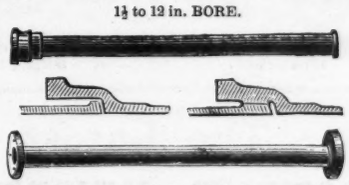
1¼ to 12 in. BORE.



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Formerly Springbank Iron-Works, Glasgow.

ESTABLISHED 1848.

Also Manufacturers of

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"ABYSSINIAN" & ARTESIAN TUBE WELLS,

FOR TOWN WATER-WORKS AND OTHER SUPPLIES.

The following Town Water-Works Supplies have been obtained by this System, viz. :—Abbott's Langley, Aldershot, Alnwick, Cirencester, Hertford, Lechlade, St. Albans, Shrewsbury, Skegness, Southampton, Stony Stratford, Swansea, Wallingford, Watford, West Worthing, Wimborne, &c.

LE GRAND & SUTCLIFF,

HYDRAULIC ENGINEERS, 100, BUNHILL ROW, LONDON, E.C.

MELDRUM'S PATENT

RETORT SCURFER

Saves its Cost many times each Year.

TESTIMONIAL.

WRITE FOR FULL PARTICULARS.

RESULTS GUARANTEED.

Gas Office, Longwood,
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Messrs. MELDRUM BROS., LTD., Timperley.

GENTLEMEN,

We have now had your Retort Scurfer at these Works for over Twelve Months, and having tried several forms of de-scurfing Retorts, we have no hesitation in saying that it is by far the best Apparatus we have tried for this purpose. **Two men have several times drawn a Setting of Seven Retorts, thoroughly cleaned the same, and charged the Retorts again within 6½ hours.** As a matter of fact, it is unnecessary for a Retort to be out of use more than 40 minutes for scurfing purposes if your apparatus is used.

After being subjected to the blast of steam and air which is injected, the scurf is easily removed with a bar without violence and consequent damage to the Retort itself.

I am, yours faithfully,
(Signed) J. H BREARLEY.

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12,000 PUMPS TRADE MARK.

Please apply for Catalogue No. 8.

STOCK AND PROGRESS.

Fig. 705. "SINGLE RAM" STEAM-PUMP.

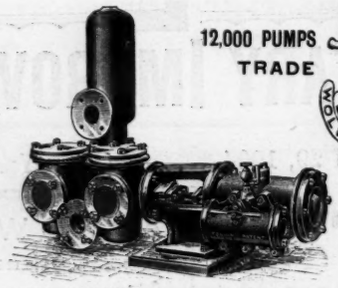


Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

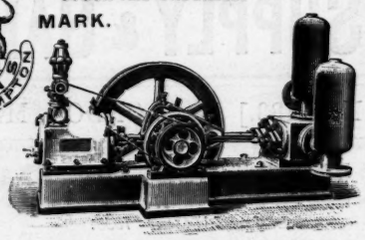


Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

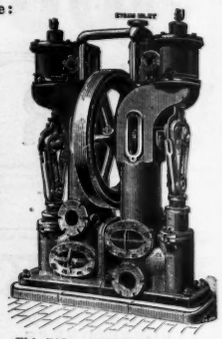
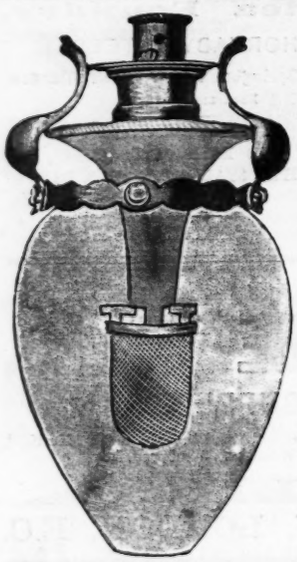


Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

The Latest Novelty in Gas Lighting is the

PATENT INVERTED INCANDESCENT GAS-BURNERS.



One-third full size.
Price: Burner with Mantle, **6/6.**
Globes from **8d.** each.

No. 1 BURNER.

The most up-to-date and economical system of gas lighting, artistic in appearance and absolutely shadowless, and readily attached to existing fittings.

A BRILLIANT WHITE LIGHT OF 65 STANDARD CANDLE POWER.

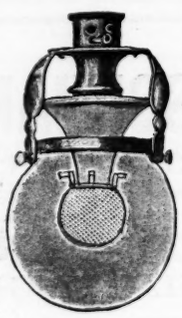
Gas Consumption only 3 cubic feet per hour.

The decorative appearance of Electric Light at one-tenth the cost.

THE "BIJOU" BURNER

Is the nearest approach to Electric Light, and lends itself more than any other gas-burner to private house lighting, having an exceedingly pretty effect when fixed in clusters of 2, 3, or 5 lights.

20 standard candle power.



Consumption of Gas, 1 foot per hour.

One-third full size.
Price: Burner with Mantle, **4/6.** Globes from **4d.** each.

THE NEW INVERTED INCANDESCENT GAS LAMP Co., LTD..

Only Address: 23, FARRINGDON AVENUE, E.C.

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WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER FOR GAS, WATER, OIL, OR OTHER PURPOSES.

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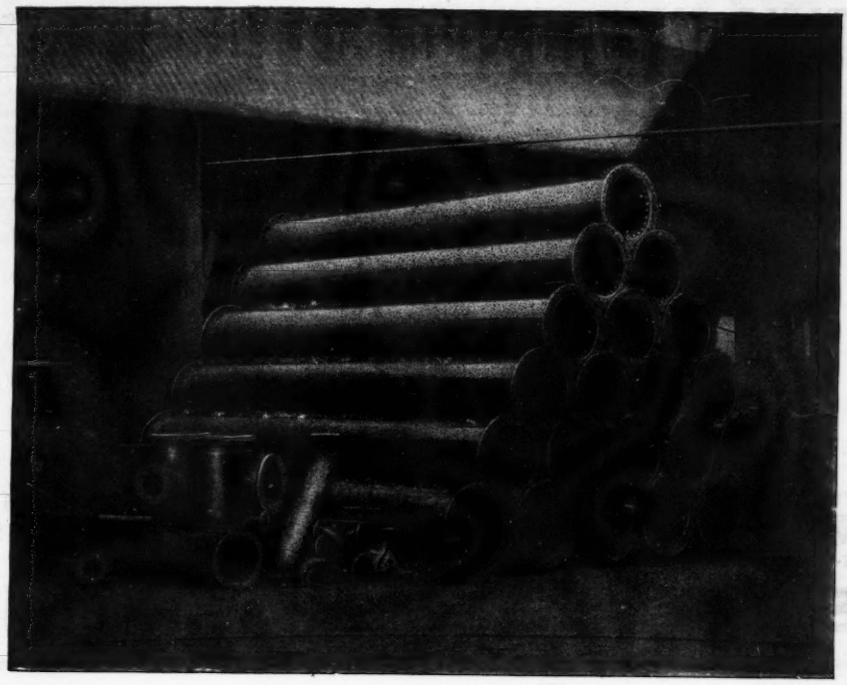

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TIP WAGONS and LORRIES of ALL KINDS for the CONVEYANCE of COAL or COKE in BAGS or BULK.

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Reliability.
Simplicity.
No Chains.

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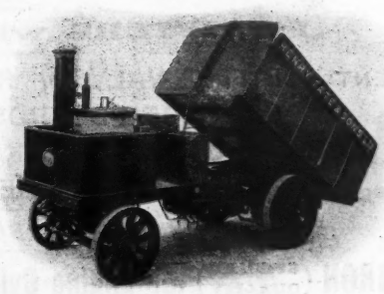

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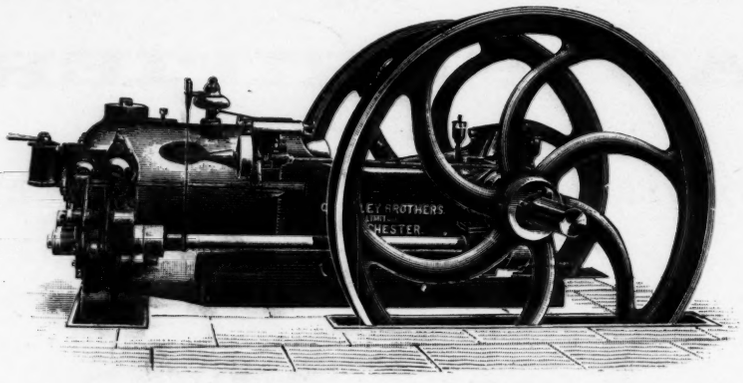
SUITABLE FOR DRIVING EXHAUSTERS, PUMPS, &c.



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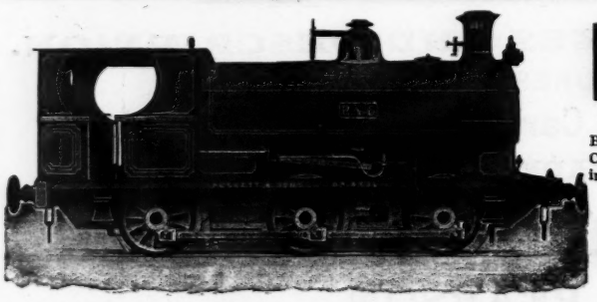

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RETORTS AND FITTINGS, MOUTHPIECES WITH SELF-SEALING LIDS.
IMPROVED COAL AND COKE HANDLING PLANT, CONVEYORS AND ELEVATORS.
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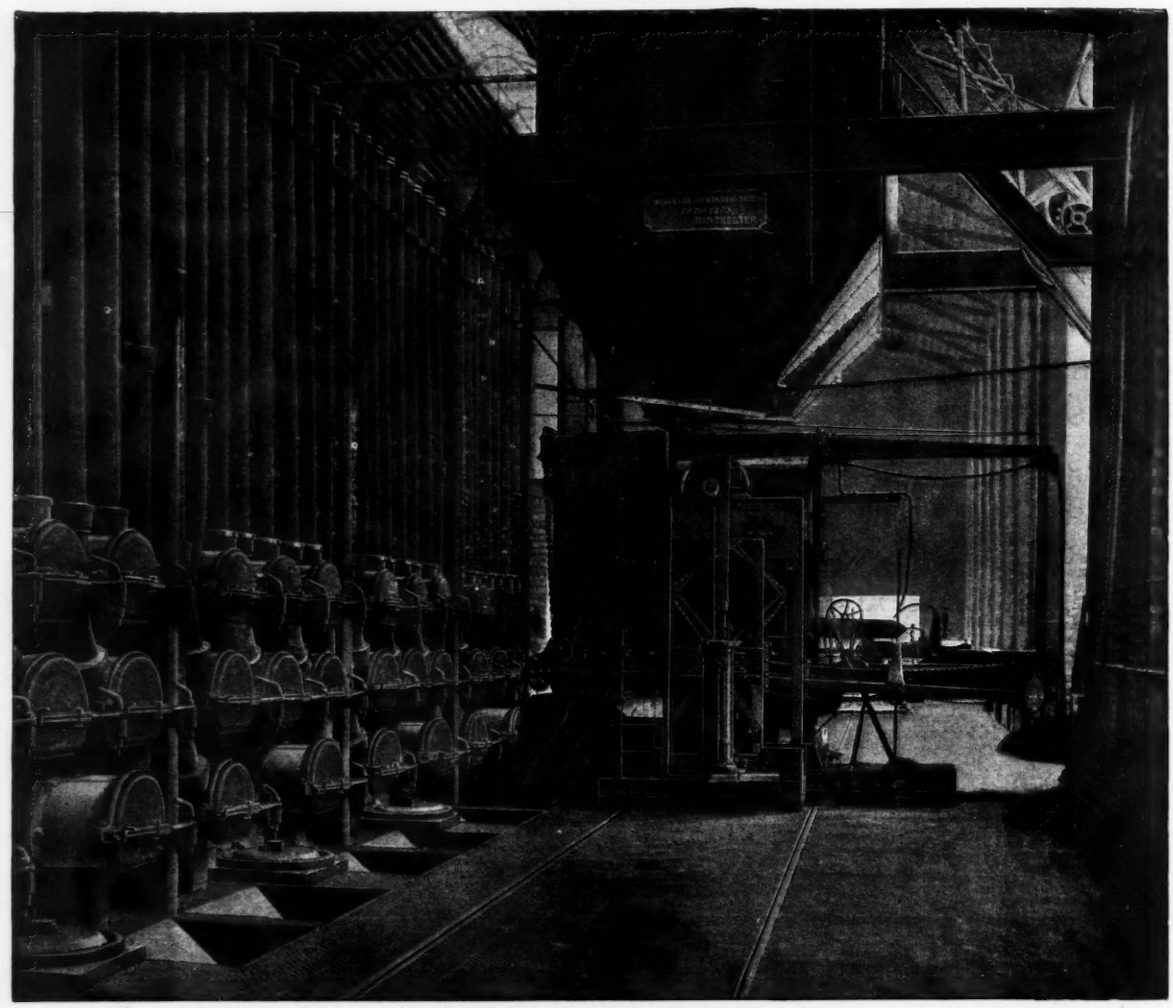

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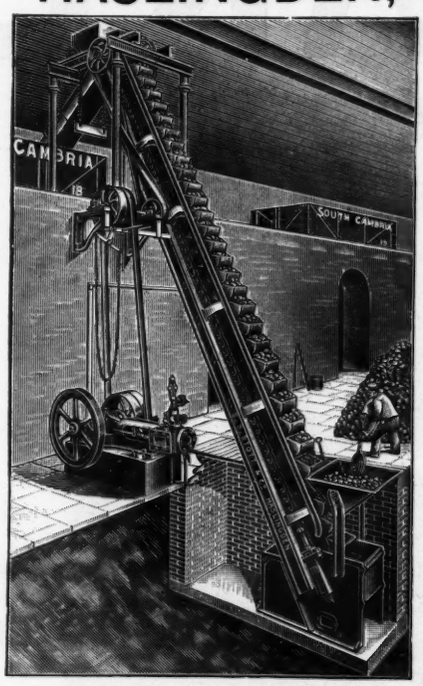

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Slow Speed. Large Area for Gas and Water.

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SUTTON	1,000,000	HERNE BAY	250,000
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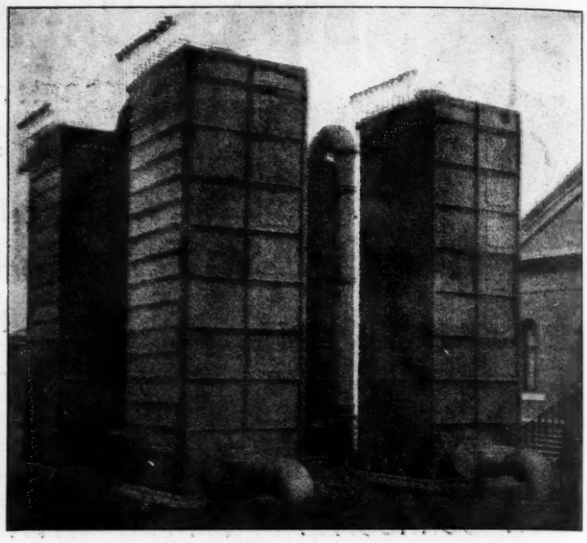

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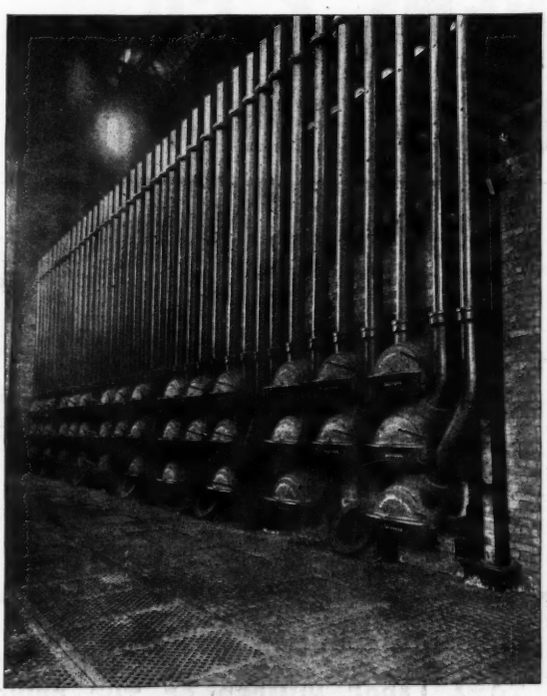

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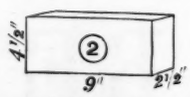

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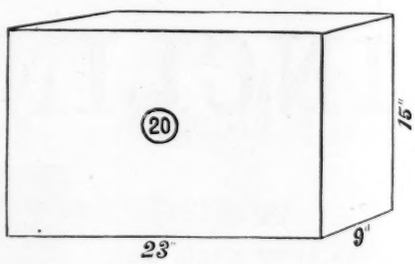

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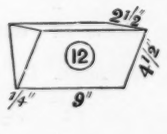

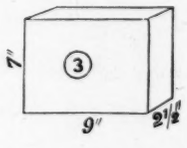

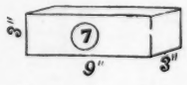

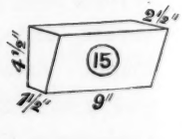

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Without doubt the finest Materials in the Market for Gas-Works Furnaces.

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BRICKS, BLOCKS, TILES, & SHIELDS of any shape made to order.

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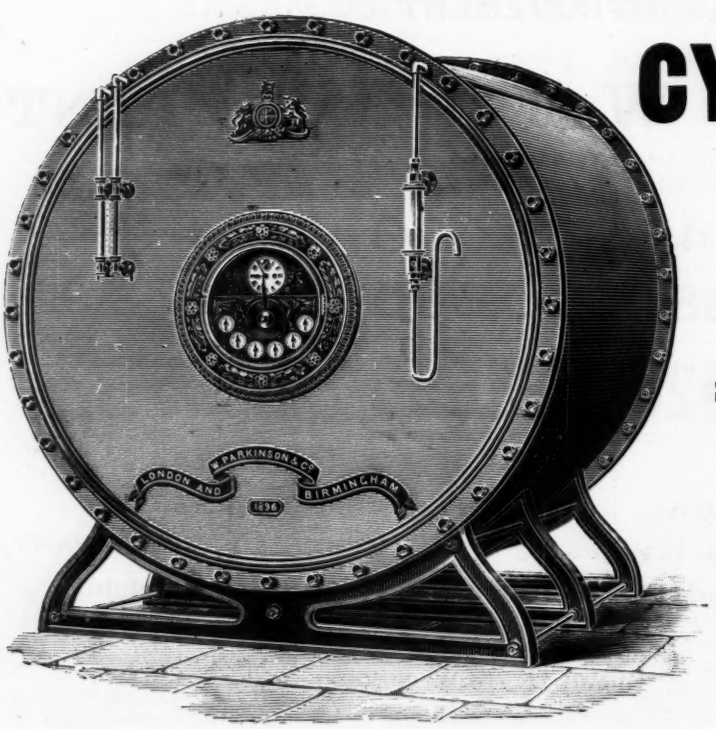

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EDITORIAL NOTES—GAS, &c.

Union is Strength!

THERE is one aspect of the question as to the possibility of carrying to its farthest scope the union of followers of the gas engineering profession in the United Kingdom, which deserves the attentive consideration of all those to whom the appeal of the Institution of Gas Engineers has come, and who wish to understand the issue. This is the relation of the particular problem to the main current of impulses, tendencies, and affects which is known by the short name of "politics." For, as the wise know, the minds of all men in a community are insensibly swayed by what is called the current politics of the hour, in the smallest as well as in the most bulky matters; and it is useless to go against the stream. Just as every tiny puddle reflects the moon, and glows in the light of the setting sun, so all the affairs of mankind take the hue of the reigning manifestations of the human spirit. We cannot help thinking the thoughts and seeing the things that are being pondered and done around us, as we walk the common road. This is to be "in the movement;" and whosoever does not feel this influence, is dead while he lives. Not that all feel alike in regard to the things that matter to the generation of the living. Far otherwise, indeed; for the opposed forces and contrary currents of opinion are of the very nature of the influence itself. There is a flow, and there is likewise an ebb, in human thought; which is always tidal. Some call this phenomenon action and reaction, or systole and diastole; and both descriptions are fair. But having regard to the fact that even reactionary influences on human affairs move forward between successive periods of greatest force, the analogy of the tidal movement seems more completely to agree with the swing of human thought than any mere pendulum action, which does not advance.

Now, if there is in the great movement of politics by which the world's business is governed, one principle that can be distinguished throughout the Ages as always sharply dividing the minds of men—although, of course, its manifestations are continually changing their form, and are not always recognizable at the time—it is the opposition of Particularism, or Separatism, and Unity. When we speak of politics here, it is always to be understood that we do not mean the personal or local, or even the national, differences of opinion and sentiment that pass by this name; but the great secular influence which is the counterpart to Religion. It is that which lies behind reason, heredity, and even temperament, and causes men, often to their surprise, to find themselves taking a common view of a matter, which is a different view from that which is taken by other men. How frequently do two men, who are in all respects the best of friends, find, when some topics come into their conversation, that they must "agree to differ" concerning them! This is politics, when the cause of division is a secular principle. Never has the Separatist been able to agree with his friend who holds the opposed point of view, though neither of them may perceive exactly wherein they differ. There is usually as much to be advanced, by way of argument, from one side as from the other. Particularism is good, doubtless; and it is highly necessary to be observed during a long and important phase of the development of all communities. The history of the ancient civilizations of the world, rightly understood, is the proof of the absolute necessity for the setting apart, and keeping apart, of things and persons for particular purposes. Where there exists a dead-level of universality, there can be no progress. That is the cause of the backwardness of the Russian people to-day. On the other hand, the backwardness of the Germanic peoples, until lately, was due to the precisely opposite condition of excessive Separatism.

These two principles of politics, therefore—Separatism and Unity—have, each of them, their proper place and purpose in the world. Like everything else, however, when out of place and misapplied they are pernicious. Mankind, being prone to err, frequently makes this mistake. Well-meaning, excellent men cling to and uphold a Separatist rule long after it has served all the good purpose that ever belonged to it; or they make a pretence of being Unionist, when their object is a most distinctly Particularist advantage. So it happens that, in the course of contemporary affairs, these ideas get gloriously muddled up; and he is a sound politician who can classify any political point of view by its right name in the higher science of politics, of which we are at present treating. To come to the exact point, which is the matter before the members of the gas engineering profession of the United Kingdom, we can now, after all this explanation of the principle at issue, ask our readers to ponder the issue in these scales, which are proper for weighing small things as great. Often—and in this truth lies the hope of escape from what would otherwise be a deadlock—when men who are Separatist without knowing it, or Unionist merely in form, are brought to a state of full enlightenment of how they really stand, their feelings change. We desire of all things to be careful to avoid question-begging appellatives in regard to this subject of greater union in the gas engineering profession, and therefore will, so far as is possible, illustrate the issue by analogy. The Scottish nationality is something for those who have it to be proud of. They are right to cherish it, wherever their personal fortunes may call them. That is a Particularism of sentiment which does not divide those who possess it from the rest of the world, not to say the other peoples of the realm. Indeed, it is something on which they can shake hands with the best men of other nations. This is because it is kept in its proper place. It is different where this good sense does not govern the case. Examples will occur to everybody, where the people of a small and weak nationality, who could never exist alone for a day, persist in keeping up a senseless antagonism against the rest of the world, just as though the secular clock, which long since struck the hour of small independent governments, could be set back to gratify their fancy. That is Separatism indeed; and a grievous spectacle it is for anyone who would fain believe that all mankind are ruled by reason.

Particularist sentiment, then, when kept in its place, is to be esteemed an excellent thing, inasmuch as it helps to prevent people from falling into a dull and drab Universalism, in the light of which there is no point of brilliancy, and no shadows are cast. Long live the good old feeling—call it clannishness, or what one will—which inspires men to hang together by the power of a common bond that does not go round too many to be felt by every one! But let us never lose sight of the signs of the times, which are unmistakable, and to be overlooked at our peril. The saying attributed to Napoleon is just. Providence is on the side of the big battalions. The battalions must be made as big as possible—it is the only way. To be an outsider is to remain an ineffective. This is the spirit in which it is to be trusted that all concerned will approach the question now before the personality of the gas industry in this United Kingdom—the realm that first of all taught the rest of the world the value of the principle expressed in the title of this article, and has never pressed it to the extreme of requiring absolute uniformity.

The Metropolitan Gas Companies' Accounts.

ON another page of the present issue of the "JOURNAL" will be found the annual tabular statement of the accounts of the three Metropolitan Gas Companies for the past year. All the Companies have now converted and consolidated their capitals, so that in this respect they once more stand upon a common and equal basis. The invested capital engaged in these undertakings amounts to very nearly 38 millions sterling. The income earned by this money amounted last year to £6,443,200, and £4,700,000 was spent on revenue account; leaving a gross profit of close upon 1¾ millions. The percentage of gross profit on the capital employed was £4 11s. 10d., which is a long way from the 10 per cent. profit imagined by some municipal politicians as the benefit private traders expect from public service works. As a matter of fact, the capital employed and paid for by the London Gas Companies works out cheaper than

any local authority can obtain loans repayable for, in the present state of the market. Merely as a financial operation, therefore, the municipalization of the London gas undertakings is clearly past praying for. The capital of all the Companies per ton of coal carbonized comes to £11 3s. 7·46d. per ton. The Chartered figure is nearly double that of the South Metropolitan; the Commercial coming fairly between the two. The total income from all sources was £1 18s. per ton on the average; the net cost of the raw material being 12s. 7·31d. per ton. Purification cost as nearly as possible 1d. per 1000 cubic feet of gas produced. The charges for wear and tear are very considerable; amounting for manufacture and distribution to about 5s. per ton, or nearly a seventh of the gross income. Bearing in mind what is so often said by way of criticism of the remissness of electricians in this regard, this figure is of great significance. The Companies spend close upon 80 per cent. of their total income on revenue account.

The table showing the increase or decrease in each item during 1903 compared with 1902 requires explanation. The large increase of the Commercial capital is nominal, due to conversion. The blank against the Chartered entry speaks for itself. All the real increase was due to the South Metropolitan. It was the same with the gas-rental. That the business was really extending under the surface, was shown by the increased rental received for meters and stoves. On the other hand, market influences showed themselves in reduced working expenses. There was a decrease of £159,525 in payments for raw materials, coal and oil; and all the concerns gained largely on the balance.

The following small table exhibits, we believe correctly, the carbonizing results of the Companies, so far as these relate to coal gas manufacture only. The figures do not require any detailed explanation or comment. For some unexpressed reason, the Chartered output of gas per ton of coal carbonized has fallen below the others; while the South Metropolitan, bent on the search for low-grade gas, has already succeeded in getting a make of 10,715 cubic feet per ton. This is encouraging. On the whole, the tables leave us with a reassuring sense of the great volume of the Metropolitan gas business, and not less of the high average efficiency with which the work is done.

TABLE *showing the Residuals produced and the Gas made per Ton of Coal and Cannel by the Metropolitan Gas Companies in the Year* 1903.

Name of Company.	Coke.	Breeze.	Tar.	Am. Liq.	Gas.
	Cwt.	Bushels.	Gallons.	Gallons.	Cub. Ft.
CHARTERED	12·41	3·95	10·25	30·73	10,148
COMMERCIAL	12·25	5·56	10·67	34·44	10,553
SOUTH METROPOLITAN .	12 35	5·22	10·14	32·52	10,715
Mean per Ton	12·41	4·53	10·24	31·65	10,383

Contractors' Complaints against Municipalities.

COMPLAINTS are being raised in business circles of the unconscionable periods during which municipalities are in the habit of sticking to money which is not theirs. At the last meeting of the Commercial Gas Company, the Chairman, being pressed upon the point, said that a good deal of the cash payable to the Company which was then in arrear, was money due by the Local Authorities. Very much the same story is told on all sides. Municipalities are sharp enough to get in their rates; but some of them do not pay with anything like the same expeditiousness. All the time, of course, they insist upon receiving the best terms from all their purveyors. Quite recently, it transpired, in connection with a lawsuit about wood paving, that it is the practice of some authorities indulging in this luxury to keep back a percentage of the payment for fifteen years—at least, so the report had it. If it had been months instead of years, the condition would have been onerous enough. Still later on, the Managing Director of a large Cable Manufacturing Company complained of the practice of municipalities in keeping back 10 per cent. of the amounts of their contracts for a year or more. Obviously, this means a sensible addition to the cost of doing work for these bodies. The firm stated that the Government practice is to pay on the completion of work. In this case, however, the probability is that orders are continually being repeated; so that the guarantee is practically, though not formally, in force. It is not the habit of municipal buyers to take any risks; and there is, without doubt, something to be said for the principle of retaining caution-money where a job is exceptional and the contractor not well known. It is the fact, however, that there is a good deal of unintelligent routine about this practice, as there is about much municipal business. Often the small meannesses of certain local authorities' office routine would put an Arab trader to the blush. Naturally, this cheeseparing economy is made up for by extravagance in other ways; saving at the spigot and wasting at the bung being Bumbledom all over. It is not often, however, that such a glaring example of this appears as Mr. Balfour Browne had to complain of with respect to the opposition of the London County Council to the Baker Street and Waterloo Railway Bill of the present session, which was merely for further capital powers. In order to provide against leakage, moreover, which might lead to electrolysis, the Company proposed to do what no tube railway had done before—that is, use an insulated return. It pleased the County Council to oppose; and consequently the cost of the Bill to the promoters has increased from about £500 to £5000, besides the Council's costs. This is the way municipal husbanding of the rates is understood at Spring Gardens.

Attempted Revival of Anthracite as a House Coal.

IT is not at all surprising that the formation of the South Wales anthracite combination should have been followed by a revival of the attempt to make a market for this product as house coal for London and other Southern towns of the United Kingdom. The other day we noticed in a newspaper an article entitled "Smokeless London," and perused it thinking to find in it some recognition of the gas-fires and cooking-stoves that have already done so much to give the Metropolis a far purer atmosphere than it had when "Bleak "House" was written. It proved, however, to be nothing fresher than a more or less intelligent anticipation of what might happen if Londoners would consent to burn anthracite. A witness of contemporary life in London recently testified that there are now fewer really smoky chimneys to be seen there than perhaps anywhere else in the kingdom. This improvement is almost wholly due to the use of gas. It is true that there remain a number of reactionary consumers of smoky coal—chiefly club and restaurant proprietors, who have not yet adopted cooking by gas; but recent Police Court decisions, to the effect that these are not private dwelling-houses, may be expected to have a salutary effect on these obstinate offenders. Consequently, the progressive elimination from the atmosphere of London of crude bituminous coal smoke may be expected to go on, irrespective of the doubtful fortunes of the Welsh anthracite coalowners in regard to their fresh attempt upon the house-coal market. There should be plenty of other uses for anthracite which happens to be satisfactorily low in sulphur and arsenic. The real competition of this kind of fuel is with gas coke, not with gas itself.

Sulphate of Ammonia Competitions Report.

The report of Mr. John Hunter to the Sulphate of Ammonia Committee, on the results of the experimental work carried out during the season of 1902, which has just been issued, should be in the hands of all interested in sulphate of ammonia, and particularly of agriculturists. The report bears the date of November last; and it may be regarded as rather belated in view of the fact that it deals with the season of 1902. But a perusal of the report and of the heavy tabulated matter leaves one with the conviction that, for an accurate compilation of this character, Mr. Hunter did not take more time than was absolutely necessary to obtain, classify, and check his returns, and to get information on the "keeping" properties of the produce. The experiments for the year, it is seen, compare most favourably with those of previous seasons in every respect save one, and the disappointment was due solely to the disastrous weather which prevailed during the ordinary harvest time, and which caused the Committee's experiments with oats to be rendered practically useless in all the districts, except one. But in every other department, the results —whether viewed as purely educative or as illustrating the greater advantage to be derived from rational manuring—must (readers will agree with Mr. Hunter) be very gratifying to the Committee, as well as highly valuable to the agriculturist. It is a matter upon which the Committee may well pride themselves that the

advantages that have been claimed by them for sulphate of ammonia in their publications have not yet in one single particular been contradicted by actual and practical experiment at home and abroad.

Sulphate in Ireland, and Suggested Regulation of Price.

The report includes one on the Cork experiments by Mr. W. M. O'Friel; and in it is discovered a statement which should claim the immediate attention of sulphate of ammonia producers, with the view of seeing that the supply of sulphate of ammonia in Ireland is equal to the demand. Mr. O'Friel's report is dated Nov. 12 last. He tells us that he is convinced there will be an unprecedented demand for sulphate of ammonia in the coming season, but that farmers all over Ireland complain bitterly—this hardly seems possible, but here it is in black and white—of it being next to impossible to obtain supplies. "I personally know," he adds, "that several manure manufacturers positively refuse to supply it to their agents." This condition of things should not be allowed to continue. Another interesting point is found in the last paragraph of Mr. Hunter's report. He has frequently heard it said by parties interested in sulphate of ammonia, that the price should be regulated, if possible, and that £11 per ton is more likely to keep sulphate of ammonia in its place with competitors than would a price of £13. Mr. Hunter does not discuss the contention; but, comparing the ammonia in sulphate of ammonia with ammonia in natural guanos at their market price per unit, the actual value of sulphate of ammonia is, he asserts, at the present moment, nearly £18 per ton. With such a large margin between the present commercial value and the intrinsic value of sulphate relative to that of the natural guanos, there seems to us to be no reason at all why any regulation of price, even if desirable, should be at such a low level as £11. The higher fertilizing value of sulphate should be quite sufficient to ensure the maintenance of its rightful position ahead of its competitors.

Work of the Junior Associations.

The junior members of the profession would appear at the present time to be giving a considerable amount of attention to the question of the purification of gas—judging by two interesting papers on this somewhat complicated subject read at meetings of their Associations last week. Mr. P. Parrish, of Dewsbury, in his communication to the Yorkshire Junior Gas Association, confined himself to considering the use of artificial and natural oxides and the burning of spent oxide for the production of sulphur dioxide, as well as its analysis for ammonia and ammonium compounds, &c. These matters, as might be expected, proved amply sufficient to provide material for a paper which will be of value to many others besides the members of the particular Association to whom it was addressed. Mr. O. W. Dougan, of the Wandsworth and Putney Gas Company, to whom the London and Southern District Gas Association had the pleasure of listening at their last meeting, dealt specially with sulphur purification; and his paper also was of much more than passing interest. It furnished clear evidence of the bestowal by its author of a great deal of attention on the subject; and it contained hints which in all probability will not be lost sight of by his hearers or by those who read what he had to say. The two communications taken together form quite a useful treatise on gas purification; and it is really gratifying to find the Junior Associations providing material of so technical a character. Of course, it is not every junior who has opportunities which will permit of him speaking on such matters from personal experience; and the two gentlemen to whom we are now referring are to be congratulated on their good fortune in this respect, as well as on their readiness to share with their colleagues the knowledge thus gained. So long as papers like these—or anything approaching them in quality—are forthcoming for their meetings, there need be no fear that interest in the proceedings of the Junior Associations will die out. Rather may a long career of ever-increasing usefulness be confidently predicted for them. We hope, therefore—and believe—that we shall have the pleasure of reproducing in the pages of the "JOURNAL" many more papers of as high a standard of excellence as those given to-day. In saying this, however, we have no wish to discourage the preparation of less pretentious communications. On the contrary, as already remarked, it is not everyone who is fortunate enough to possess facilities for acquiring personal experience in the more advanced branches of the profession; and no member can be expected to do more than his best to further the interests of his Association. Provided each one will do this, all will be well.

Gas Supply in Germany.

Several points of interest are referred to in the annual statement of the German Continental Gas Company, an abstract of which will be found in to-day's issue. As might be expected from the fact that trade conditions were better last year than in the greater portion of the preceding twelve months, the progress made by the Company in the period under review was of a very satisfactory character. It is true that the dividend remains the same as for 1902—10 per cent., as compared with 12 per cent. for 1901, and 14 per cent. for the year before that—but a largely increased sum has been placed to the credit of the renewal fund, and the carry-forward is also substantially greater. There was an increase of 7·78 per cent. in the production of gas, as against 4·85 per cent. for the previous year; and instead of the considerable decrease in profits which had to be reported in 1902 and 1901, there is on the present occasion an increase of over £18,000 under this head. The low price of coke, to which the former falling off in profits was mainly attributed, is still affecting the accounts; the receipts from this source having dropped still further in the past year, though there was no corresponding diminution in the price paid for coal. The use of gas for heating and power purposes continues to make headway; there having been an increase of 10·47 per cent. in this branch of the business, as compared with one of 5·81 per cent. in the lighting consumption. Of the total production, 22·53 per cent. was used for heating and power, as against 21·98 per cent. in 1902; while the proportion employed for lighting was 72·74 and 74·09 per cent. respectively. The balance of the make, of course, represents the unaccounted-for gas, which amounted to 4·73 per cent. last year, compared with 3·93 per cent. in 1902. The improved industrial outlook has naturally had a considerable effect on the quantity of gas used for motive power; and with a continuance of improved trade conditions, further, and important, progress in this department may safely be looked for. It may be pointed out that the Company, who possess works at Warsaw, do not, "having regard to the great resources of Russia," anticipate any serious results to the gas supply there from the Russo-Japanese conflict; the worst feared being that the great increase of consumption experienced at these works in the previous year may not be maintained during the current twelve months.

Suction Gas-Producers.

Eagerly, however, as the facts and figures above referred to were no doubt scanned by the shareholders of the Company, there are other matters touched upon in the report to which it was our intention to more particularly call attention. The first of these is with regard to the most advantageous fuel for the driving of gas-engines. Of late, a good deal has been heard about suction gas-producers; and the Company state that a "vigorous agitation" in favour of them has been in progress in Germany. In spite of this, however, there was an increase of close upon 3 per cent. in the amount of gas supplied to engines; while only eleven out of the 1093 engines which the Company were supplying at the beginning of last year were converted during the twelve months for the consumption of power gas from suction producers. The Company have themselves been experimenting on a large scale with this type of plant, in connection with their workshops and electrical station at Dessau; and they find that an economy in the consumption of fuel is thereby realized. They are, however, of opinion that the advantages of a supply of coal gas must often outweigh this saving of fuel; and that coal gas will therefore continue to successfully compete with suction producers. In the next place, the Company are not afraid to express their disbelief in the commercial possibilities of the many central station poor fuel-gas schemes now being advanced in Germany and elsewhere; their view being that only a relatively rich gas, like coal gas, will pay for distribution in this way. No doubt, in course of time these points will be definitely settled; and it is to be hoped that the opinions put forward by the German Continental Gas Company (and which it may be taken for granted are likewise those of their eminent

Director, Herr W. von Oechelhaeuser) will then be found to have been fully justified—even though they may now be regarded by opponents as being not altogether unprejudiced.

Offering Stock to Consumers and Employees.

Gas companies who have in view an application for extensions of their statutory powers should remember that Parliament does not look with an unkindly eye upon the seeking of authority to first offer new stock or shares to consumers and employees, instead of submitting such capital to public auction or tender. The policy of doing this, in the interests of the gas suppliers themselves—a policy championed by Sir George Livesey and in the "JOURNAL" columns at various times—is irrefragable; and the farther it is carried, so much the stronger will the undertakings adopting it become. This variation of the auction clauses was first granted in the South Metropolitan Gas Act of 1901, then in the Bromley Act of the succeeding year, and other companies have since followed suit. There are instances of applications in the same line in the present session; one of them being that of the Croydon Gas Company. Their clause, following precedent, is to enable them in the first instance, with the approval of the Board of Trade, to offer stock to be sold to the gas consumers and persons in the Company's service at as near as may be, but not more than, 5 per cent. below the average market price of such stock in the month immediately preceding the offer. The matter was specially referred to when the Bill was reported to the House last week; and the Committee who had considered it stated that, after hearing evidence on the subject, they considered the proposed variation of the auction clauses might be sanctioned. There is sufficient precedent now to make the granting of similar applications almost a matter of certainty.

The Ill-Fated Osmium Electric Lamp.

There is good hope that the end for which the Directors of the Welsbach Company have been working in connection with the Austrian Company—that is to say, the severance of the incandescent gas part of the undertaking from the electrical—is in a fair way of being reached. On Saturday last, an extraordinary general meeting of the Austrian Company was held in Vienna for the purpose of considering the necessary resolution authorizing the separation of the two undertakings. The electrical undertaking, it may be remembered, was built up with scandalous recklessness, on the pretensions with which the osmium electric lamp was clothed. What the lamp has brought upon the English Welsbach Company was made known in the remarkable revelations which the present Board made in the statement published in the "JOURNAL" for May 12 last (p. 393), a week previous to which they had been empowered to take all the steps that, in their judgment, were considered necessary to effect the separation. Now that events have got to the present stage, interest is revived in the history of the osmium electric lamp and of the multifold financial transactions in connection with it, as told in the statement issued last May. The hopes successfully built upon that lamp by financial wire-pullers showed the remarkable gullibility of the public. Regarding last Saturday's meeting, a Vienna telegram to the "Frankfurter Zeitung" states that all the "B" shares—that is, those issued to, and held by, Dr. Auer von Welsbach for the osmium electric lamp patents—were represented, together with 1416 "A" shares. With three dissentients, the resolution was adopted approving the agreement with the English Welsbach Company in respect of the transfer of the osmium lamp department, and to cancel the 4,000,000 kronen of "B" shares representative of the osmium patents. Only one shareholder opposed the scheme, on the ground that the Company interested in the osmium lamp patents for Germany have already disposed of 100,000 of the lamps.

The Reform of Private Bill Procedure.

The reiteration of the necessity, in the interests of commercial and other beneficial legislation, of reform in the present system of transacting public and private business by Parliament and Parliamentary Committees will assuredly soon have some tangible effect. If not, it will not be the fault of responsible bodies representing important sections of the community. The subject forms a standing item in the programmes of certain bodies for their annual conferences. Not for the first time, the Association of Chambers of Commerce have just urged upon the Prime Minister and the Government the imperative necessity that exists for action being taken, and have asked for a deputation to be received to submit their views on the subject. They actually go the length of hoping that the Government may see their way to bring in a Bill in the current session to deal with the matter. But such a hope, in the present political situation, may as well at once be quenched. Two amendments which the Association consider of importance are: "(1) That Bills which have passed their second reading in one session be taken up in the next session of the same Parliament at the stage which they had reached in the preceding one. (2) That inquiries into Private Bills be conducted locally before Commissioners appointed by Parliament in a similar manner to that prescribed by the Act of 1889 with regard to Scotch Bills, instead of before Committees of the Houses of Parliament." The latter is a proposal that is getting grey with age, and which has often been discussed up and down in many places and by many men. England is not Scotland; and when there are something like 200 Private Bills introduced—excluding Provisional Orders—in one session (this session is a poor one with 159 Bills), the number of itinerant Commissioners required, and the extra machinery necessitated by the decentralization of the work, would result in much greater expense being thrown upon the parties concerned or the country, and besides would not, it is feared, conduce to expedition. Of course, there are, as in most such questions, several decent arguments to be advanced in favour of the suggested system; but there are reforms in procedure which could be introduced more readily at Westminster, and which would greatly facilitate business.

The Question in the House.

At the same time, there appears to be a disposition in the House that a solution of the problem of how best to deal with the matter should be sought. The second reading of the Private Legislation Procedure (Wales) Bill was agreed to on Friday night. The Bill provides that, in cases where Local Authorities in Wales desire to promote a Bill, the machinery to be adopted should be similar to that which has been applied to Scotland. While the Government, through Mr. Long, express themselves as sympathetic towards any proposal having for its object the devolution of Private Bill work, they are faced by the difficulty that, if the principle of the Scottish Act is applied to Wales, it must be adopted for other parts of the country. Again, the Welsh Bill proposes that a Joint Counties Board should be set up as a Court of Appeal; but this the Government do not regard as the right authority for the purpose. However, on the understanding that the part of the Bill dealing with this last-named matter stood apart, the second reading was agreed to, in order that the Bill might be referred to a Select Committee for consideration. But this Committee will not be appointed until the terms of reference have been distinctly determined.

WATER AFFAIRS.

The East London Water Company's Meeting.

SINCE the Chairman of the East London Water Company—Colonel Lockwood, M.P.—addressed the proprietors last October, the Company, in conjunction with the seven others supplying the Metropolis with water, have passed through a very trying ordeal. They have had their sources of supply condemned, the value of their works depreciated, and their affairs generally criticized in a manner which almost surpassed the efforts in this direction of some of their most virulent detractors of a past time. They have also had to submit to the scrutiny of a Court of Arbitration composed of three distinguished experts. But the result has simply been a repetition of what has occurred on the occasion of inquiries before Parliamentary Committees and Royal Commissions. The unjustifiable attacks utterly failed; and the Company have come out—using the words of the Chairman at the half-yearly meeting last Thursday—"more than con-"querors." They have been awarded something for which their opponents offered them nothing; and even if they

should not succeed in establishing their claim to the higher of the amounts named by the Arbitrators, they will in any event have the satisfaction of knowing that the President of the tribunal before whom they appeared completely disposed of the reckless accusations which had been made against them. Colonel Lockwood did well to emphasize this point on Thursday, because the remarks of Sir Edward Fry were amply justified. This, however, in his opinion, can scarcely be said with regard to the view taken by the Arbitrators as to the dividend-earning power of the Company in the future. They are now paying 8 per cent., and if they had been left alone, they would probably, at no very distant date, have reached the 10 per cent. which the Arbitrators deemed to be unattainable. We join Colonel Lockwood in expressing regret that the Company's works were not visited by at all events one of the Arbitrators, because we consider personal inspection of them would have led to a fuller appreciation of their condition and capabilities. This, however, was not deemed to be necessary; and as the award has been made there is nothing more to be said. If the Company succeed in getting the £4,300,000, it will work out to 250 per cent.; if only the £3,900,000, it will be 226 per cent. With regard to the general business of the Company, there has been a temporary lull, so that there was only the exceptionally small increase of £191 in the water-rates in the six months ending at Christmas last. This depression, however, cannot but be temporary; and the only regrettable thing is that when better times come the Company will not be in existence to profit by them.

The Prevention of River Pollution.

Once more an attempt is being made to improve the law for preventing the pollution of rivers and streams, by extending to all County Councils, Joint Committees, and Rivers Boards in England the main provisions of the Mersey and Irwell Act of 1892 and the West Riding of Yorkshire Rivers Act of 1894. Last week there was issued by the King's Printers the Bill introduced by Sir Francis Sharp Powell early in the session, and backed by a number of influential members. The object of the measure is undoubtedly a good one; but, judging by what has occurred in previous years (for this is one of the "hardy parliamentary annuals"), we doubt very much whether it will be achieved. The Bill will stand on the paper from week to week, and in all probability quietly drop out towards the close of July. The prevention of river pollution is one branch of a very large subject which is now being inquired into; and until that investigation is complete it would seem inadvisable to legislate upon it. The Royal Commission on Sewage Disposal consider it is of sufficient importance to call for the creation of a separate authority dealing solely with matters relating to rivers and their purification; and the opinion is gradually growing, as we remarked a fortnight ago, that the constitution of some central body, occupying itself specially with hygienic questions, would be a distinct public advantage. It seems to us, as suggested by Mr. Percy Griffith in his letter last week, that this is a subject on which it is desirable to have united action by the various interests affected. As already mentioned in our columns, a small Committee has been formed to watch these matters in Parliament; and the name of Dr. Farquharson, the Chairman, is upon the back of the Bill above alluded to. Surely it would be practicable to enlarge the Committee by the addition of representatives of the different administrative bodies concerned; and if this were done, concentrated action would doubtless be ensured in the direction of solving not only the problem of keeping our rivers as free as possible from pollution, but others which more or less directly affect the health of the community.

In order to prevent the iron or steel framework of furnaces from being carbonized by the action of the oxides of carbon diffusing through the refractory lining, M. Cottancin has devised an arrangement whereby the steel or iron columns are surrounded by a protective casing of copper, or some other metal which does not get carbonized, and the space between filled in with some oxidizing material, either in the form of powder or mixed with clay. The furnace is built up of square hollow iron boxes, filled with a refractory material, and clamped or hinged together, and to the framework by suitable means. Or the iron boxes may be dispensed with, and the bricks embedded in some refractory clay. The bricks may be perforated or hollow, so as to allow any desired oxidizing, reducing, or carbonizing material to be filled in.

CHEAP GAS—THE ELECTRICIANS' DESPAIR.

Not long ago, a complaint was published in the "Journal" respecting the repellent commercial policy of a particular Gas Company. As a converse tableau to the antiquated devices still practised in some localities with the object of assuring the eligibility of prospective consumers of gas, it is desirable to note the energy with which electricians are seeking fresh customers by every possible means. Thus, in a leading electrical journal, the suggestion is offered that private residents who are already consumers should be offered some inducement to become canvassers among their acquaintances. One such bait proposed is that of "allowing one quarter's electricity account to remain unpaid, provided two other consumers of similar capacity were induced to sign applications for supply." This idea has received some commendation, with the amendment that the privilege should be extended to shopkeepers, every one of whom is to be converted into a tout for the electricity-supply company, or the local authority, by the hope of getting as commission one unit gratis for every 8-candle power lamp equivalent connected through their efforts. It is admitted that the question is one that presents difficulties. It is suggested that an energetic and persuasive individual might succeed in getting more custom for electricity than his own. This arouses the further consideration of how he is to be remunerated without money passing, which is regarded as objectionable. In this event, he would be entitled to more lights, or in the case of a "free-wired" canvasser, his commission might be put to the credit of his indebtedness for his installation. Note the artless confession in this connection, that what is called free wiring is something that has to be paid for! But there are even more fantastic proposals for recompensing the private canvasser, as that, where traction and lighting are combined, the extra reward could take the form of passes on the cars lasting for various periods.

All these suggestions arise from the popular recognition of the fact, which regular professional canvassers for electric lighting are obliged to reckon with, that gas light is cheaper—very considerably so, in fact. A candid statement of this truth was made by Mr. H. Waymouth Prance, who belongs to the Institution of Electrical Engineers, in a letter published by the "Electrical Review" for the 11th inst. Usually, such statements of fact are due to gas engineers; and for this cause they are systematically ignored by the other side. It is for this reason that we quote from Mr. Prance, who wrote in reply to an inquiry from a gentleman of the same calling, who was troubled by the fact that, with electricity costing 5d. per unit, the ordinary incandescent lamp is out of the running, and even the Nernst lamp has quite a hard struggle to keep pace with gas at anything less than 4s. per 1000 cubic feet. An editorial attempt was made to dispel this inquietude, with an assertion that the gas consumption per candle power is not everything. It was asserted that the amount of gas consumed in bye-passes should also be taken into account, "for it attains a high value in the aggregate." Further, a case was attempted to be made out for the greater divisibility of electricity as compared with gas. "Incandescent gas-mantles are only made for nominal candle powers (at starting) of about 50 and 25; hence, in a place where an 8-candle power glow lamp would supply all the light required, it must either be replaced by a 25-candle power gas-mantle, or by a common gas burner, which would consume as much gas as the former." This attempt was well meant; but it failed to convince. It was left to Mr. Prance to adduce the results of recent experiments of his own—apparently made with the Gaslight and Coke Company's gas, priced at 3s. per 1000 cubic feet. He gave the results in terms of the quantity of gas burnt per candle power per hour, the average for good flat-flame burners being 0·31 cubic foot, and for incandescent (of a kind not stated) 0·05 cubic foot. The corresponding costs are 0·0112d. and 0·0018d. Taking an average incandescent electric lamp, consuming current at the rate of 4 watts per candle, and energy at 6d. per unit, the cost per candle power for electric lighting is 0·024d., "from which it is apparent that, under average circumstances, gas is the cheaper form of illumination." This is the verdict of Mr. Prance. It will be observed that, according to him, the incandescent electric light at the prices taken costs, as nearly as possible, twice as much as flat-flame gas lighting, and is dearer than the incandescent gas burner in the proportion of 0·24 to 0·018; or 13⅓ times. This is fully as much as ever gas engineers have contended for, and been fiercely attacked in the electrical journals for presuming to claim. It stands unquestioned.

Of course, the damaging effect of this admission is immediately counteracted, so far as is possible, by the claim of superior healthiness and convenience, and so forth, on behalf of the electric light; but it is no longer concealed that considerable difficulty is experienced in making this particular cock fight so valiantly for his owners as formerly. Naturally, it is believed that every shopkeeper and householder who has sense enough to absorb the whole doctrine, must be easy to persuade that "even at a higher cost per candle-power-hour, electric lighting offers so many advantages over gas lighting as to make it infinitely cheaper in the end." Unfortunately, however, in the rough-and-ready way of the market-place, people will not always see the wisdom of sacrificing an immediate advantage, in the hope of securing a dim and distant benefit. This class of possible consumers is confessedly a large one, and is represented everywhere. In the case of private residents, mostly living in rented houses taken on short

terms, the landlord, not the tenant, does the decorative repairs; so that the claim of the electricians to save a coat of whitewash for the ceiling in three years does not carry much weight with the occupiers. The electricians who urge this plea never seem to perceive that they thereby raise the question of comparative costs, and set people thinking which expense they will prefer. Where the extra payment for light must come out of one pocket, while any possible economy of whitewash will spare quite another party, the failure of the argument so based is inevitable. And even in the case of business premises, where the tenant pays for the decoration, the plea of saving in this respect is of small avail to a tradesman who knows the commercial value of cleanliness and brightness.

It must be admitted, however, that there is one consideration, before which the question of the comparative cost of two possible alternatives fails. If a man likes one thing better than another which might otherwise answer the same purpose, and can afford to indulge his preference, there is nothing more to be said. As well run one's head against a brick wall, as contend against a man's taste. Gas companies, at any rate, are never likely to make this mistake. Their very lethargy, in this regard, assumes the character of a safeguard. It would be far from correct, however, to allow it to go by default of protest, that, as a matter of taste, everybody with any pretensions to correctness of judgment in the selection will prefer the electric light. It is notoriously not so; for many people, otherwise sane, do not like the electric light. There may be, and doubtless are, reasons for this bent of taste; but it would be futile to enumerate or dissect them. People frequently allege grounds of reason for their tastes; but the truth usually is that the taste is beyond the reasons given for it. There yet exist some persons, whether many or few it is not now our care to inquire, who retain a decided liking for flat-flame gas lighting in preference to any other. If they can afford it, why should not they still enjoy their fancy? The curious reflection arises in regard to this idea, that those opponents of all progress on the part of gas companies who have, when it suited their purpose, made so much fuss about the preservation of the integrity of the flat-flame burner, always based their case on the presumption that it is the poor man who is most interested in this matter. The truth is that the boot is on the other leg. The poor consumer of gas cannot afford to waste it in flat-flames, while he can, and does, take the greatest care of his incandescent burners. It is a striking exemplification of the rigidity of ideas, not altogether uncontaminated with snobbery, that seems to be inseparable from the otherwise candid English spirit, that incandescent gas-burners should ever have been regarded—as they were, almost as a matter of course—as unsuited for the use of slot-meter consumers. Why average mechanics, who are accustomed to American organs and sewing-machines, should be considered incompetent to handle any gas-burner, it would be difficult to say. It is to be feared that there is much downright nonsense about this business of flat-flame gas-burners and their users. Certainly, it is not the poorest class of gas consumers who have most reason to use them.

All this discussion of the traffic in gas and electricity supply, and the burners and lamps employed for the purpose, brings one back to the consideration of canvassing, or recommendation, as between members of the public. We have seen something of the length to which electricians are willing to go to get someone to speak on their behalf the "word in season," which costs little, but is worth much. What friends has gas, to do the same? It is not a question here of any of those fantastical forms of commission on orders which were mentioned in the beginning of this article, but of ordinary business arrangements. Gas companies ought to have their own systems and scale of commissions on the procuring of new customers, available by the numerous followers of the housing trades, ironmongers, and others. Unless gas is represented in this way, as electricity supply is, it will suffer disparagement. Electricians subsidize the speculative builders—getting these enterprising tradesmen to wire instead of piping their new houses. Sometimes they will wire the builder's own house free, or do something of the sort, in order that he may speak well of them. There is no reason at all why gas companies should shrink from similarly offering the proverbial *quid* for the desirable *quo*—quite the contrary, indeed. One of the ill-effects of the loss of the trade in gas-fittings by ironmongers is the lack of interest displayed by these shopkeepers in the prosperity of the gas business. The most alert and up-to-date among them call themselves electrical contractors. No special training is necessary for this additional branch, which any intelligent bell-hanger can pick up as he goes along. In the ordinary way of town life, is there a single shop, usually, in any part of the district, where the gas company have a friend, a place of call, or anybody to say a good word for them in the way of trade? Mr. Henry Green, of Preston, had district collectors for prepaid gas at the district post offices. His example has not been followed. It is high time that gas managers took the usual means, where these have been neglected, for securing friendly co-operation by people in trade with their own living to earn. It is well known that the London Gas Companies, when they wanted the slot-meters to get widely known, paid introducers small premiums on all new connections. As the flood of applications rose, it was found a good plan to require every applicant from a new street to interest himself to the extent of bringing in as many of his neighbours as possible, which helped to reduce the expenses. This is the idea that might be cultivated throughout the industry, in all probability to good effect. The gas manager should try to get as many of his fellow-townsmen as he can reach, to believe in gas as firmly as he does himself. Even his rivals, the electricians, believe at last in the superior cheapness of gas; but it is not to their interest to keep this knowledge before the public, as it is that of the gas manager.

SULPHATE OF AMMONIA EXPERIMENTS.

ANOTHER valuable report has been submitted to the Sulphate of Ammonia Committee by their scientific adviser, Mr. John Hunter, of Edinburgh; and the document adds to the strength of the monument of justification for their existence that the Committee have already erected by their work. The report is not of a character that will, in view of the necessarily extended tabulation of the results of the experiments dealt with, admit of any general condensation; and therefore those who may be interested by this reference to the document, should not fail, if they have not already received one, to secure a copy.

The report treats of the experiments of 1902, which, Mr. Hunter says, compare most favourably with those of previous seasons in every respect save one, and the disappointment was due solely to the disastrous weather which prevailed during the ordinary harvest time, and which caused the Committee's experiments with oats to be rendered practically useless in all the districts except Selkirkshire. In every other department, the results must be gratifying to the Committee. They are most valuable to the agriculturist, because they encourage home experiments, which must be much more valuable to the farmers themselves than all the efforts of the numerous lecturers who are just now swarming over the country. In all the Committee's publications, certain advantages for sulphate of ammonia have been claimed—calmly and reasonably; and there has not yet been one single contradiction resulting from actual and practical experiment either at home or abroad. Comparison has been courted with any and every other nitrogen-containing fertilizer; and in every case where comparison has been made, the results have been almost monotonously uniform.

As in former years, the Committee have, Mr. Hunter states, been employed largely as a consultant in the matter of manuring in agriculture, floriculture, and fruit growing; and it is assuring to find inquirers return year after year with a frank admission of benefit from earlier advice. From all quarters comes absolute confirmation of the Committee's claims as to the advantages of ammonia—viz., superior quantity, quality, and keeping properties of crops grown by its aid. It must not be thought, remarks Mr. Hunter, that any attempt is here made to belittle the merits of manurial bodies containing organic nitrogen—such as guanos, Liebig's bone meal, fish products, and other similarly good material, because these are all excellent sources of nitrogen or ammonia, and suitable for grain crops in general, and for all crops on light soils. They are not, however, so readily available as sulphate of ammonia—except in the case of ammoniacal guanos—because their nitrogen requires to be converted into ammonia compounds in the soil before they are comparable with sulphate of ammonia. The next step in this progression is the converting of ammonia compounds into nitrates by the groups of nitrifying organisms; and it is this stage which calls for the most careful consideration by the agriculturists of this and all other countries. While the nitrification of ammonia salts is going on, the potash compounds, phosphates, lime compounds, &c., are being acted upon by the groups of advantageous soil organisms, with the result that the plants are presented with a complete soluble and diffusible food. Herein lies the great contrast between such nitrogenous bodies as have been mentioned and alkaline nitrates—such as nitrate of potash and nitrate of soda, or nitrate of lime, when this is obtainable at a reasonable price. These nitrates are all readily soluble and diffusible. They do not undergo any progressive change in the soil; consequently they are absorbed by the plant unaltered—alone, or nearly so—and because of the absence of balance, the plants are stimulated abnormally. They grow rank, they keep green long—that is to say, ripening is delayed; the grain crop is extremely liable to lodge without any hope of again getting on its legs. There is, of course, another possibility with these soluble nitrates—viz., that in such very wet seasons as have prevailed in late years, nitrates are liable to be washed past the root-range, and lost completely. It is not so with sulphate of ammonia, because it is assuredly "fixed" in the soil until it undergoes nitrification (a process which is slow but steady), and consequently keeps feeding the plant for its whole period of absorption and assimilation.

The tabular statement appended to the report of the results of experiments carried out under the ordinary systems of cultivation in the numerous districts embraced, ought to prove highly instructive if carefully studied. Commenting on the statement, Mr. Hunter observes that it may be well once again to entreat readers of these reports to give attention to the oft-repeated suggestion that, on lands which have not quite recently been limed, the annual application of about 5 cwt. of ground lime per acre will prove a very profitable application to all crops; but in the case of old pasture, and especially if it be "fogged," the application of 10 to 12 cwt. per acre will turn out highly remunerative. The value of this treatment has been proved up to the hilt on the Dalmeny Experimental Station—indeed, it has been regularly

practised for at least twelve years on the whole of Lord Rosebery's estate, and no larger or finer crops of potatoes can be seen anywhere. It is simply a fact that, if this small dressing of 5 cwt. per acre be regularly used, a much greater percentage of benefit is got from the farmyard manure, in addition to the increased benefit from such artificials as guano, sulphate of ammonia, bone manures, or other high-class nitrogenous manures. It is particularly beneficial where ammoniacal guanos or sulphate of ammonia are employed; but it must be sown a few weeks before applying light manures.

In some notes on Class 1 of the experiments—viz., yellow turnips—Mr. Hunter finds an opportunity for remarking that there is not to be found here even a suggestion of contradiction of any of the predictions or claims of the Committee, nor of the valuable lessons pointed to by the greatly prized experiments. Some people have been good enough to suggest that these experiments are arranged for the purpose of booming sulphate of ammonia. But this is a gross misrepresentation, as can at once be proved by reference to the agricultural press of the country. "The reports of experiments carried through by the Potash Syndicate, for example, show in every case the superiority of sulphate of ammonia—in all their numerous experiments there is not a single exception. Take the experiments of many of the Agricultural Colleges of the country, and the same result is found. Look to the Board of Agriculture in Ireland, whose agricultural 'head' is one of the ablest of the agricultural scientists of the British Isles. They have determined which is the best source of nitrogen for Ireland in the mixtures which they have recommended to the farmers for the various crops; and that source is sulphate of ammonia! The scientific adviser to the Board is one of the few who have accepted the teachings of—and has himself taught—the newer and truer science of agriculture; so that, knowing what is scientifically accurate and true, and what therefore must be sound in practise, he advises the farmers of that country (of which he is the agricultural head) to use sulphate of ammonia; and it is the only source of nitrogen which he appears to have recommended." The experiments to which Mr. Hunter refers next show increased crops, and augmented profits per acre of land, not only in the class specified at the beginning of the previous paragraph, but in the several others.

It will be remembered that the Committee were in evidence at the Cork Exhibition last year. They had a really magnificent collection of novelties in seed grains, potatoes, turnips, &c.; but, in addition, there were also 16 experimental plots laid down to illustrate various points in manuring, and also to show the difference between small seed and good medium-sized seed in potato culture, and, further, to show the advantages of uncut as compared with cut seed. The results from these experimental plots confirm most markedly the evidence furnished from all sections of the country, and show in every case such a handsome increase from the use of sulphate of ammonia as should ensure its more universal employment. It should be observed that on the plots where sulphate of ammonia was not used, there was a full supply of nitrogen in the bone manures used, so that the experiments illustrate what really and certainly can be obtained in increased crops and increased profits by the judicious addition of moderately small dressings of sulphate of ammonia. Reporting on these experiments, Mr. W. M. O'Friel says: "The plots were visited by a great number of intelligent farmers from all parts of Ireland particularly, and a good number came from England, Scotland, and Wales. There were visitors also from Australia, New Zealand, the United States, the Argentine, Canada, &c. I am convinced there will be an unprecedented demand for sulphate of ammonia in the coming season. Last year's exhibit of specimens grown with the aid of sulphate of ammonia, and the great distribution of sulphate of ammonia literature, created a wonderful interest in the article; but farmers all over Ireland complain bitterly of its being next to impossible to obtain supplies. I personally know that several manure manufacturers positively refuse to supply it to their agents. I would respectfully suggest that some means be devised whereby purchasers would be informed where it could be procured during the season. I was honoured by the inspection of the sulphate of ammonia plots by their Majesties when visiting Cork. These were the only plots inspected by them."

In the concluding lines of his report, Mr. Hunter recognizes that the interest which has been taken in the Committee's experimental work is increasing and extending; and no better evidence of this could be found than in the increased requisitions for grants, and in the numerous letters of appreciation which the Committee have received. "Your reporter," he adds, "has frequently heard it said by parties interested in the sulphate of ammonia business that the price should be regulated, if possible, and that £11 per ton will be more likely to keep sulphate of ammonia in its place with competitors than would a price of £13 per ton. Without discussing this question, it may be pardonable to point out that if we compare ammonia in sulphate of ammonia with ammonia in natural guanos at their market price per unit, the actual value of sulphate of ammonia at the present moment is nearly £18 per ton."

At a meeting of the Leeds Gas Committee last Wednesday, it was decided to recommend the City Council to increase the salary of the General Manager (Mr. R. H. Townsley) by £100 per annum.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see p. 854.)

THE rate of increase in business on the Stock Exchange which was noted in our last issue was too good to last; and accordingly it was not well maintained in the week just closed. For some reasons—the near loom of the holidays perhaps among others—business was very quiet throughout the week, and dwindled away to a minimum towards the close. Movements were very irregular, owing to conflicting agencies. The successful launch of the Irish Land Stock was a bright factor, and the outbreak of plague in the Transvaal was a depressing one. In American rails, there was a wild ferment, in which prices boiled up to high figures. Despite the quiet finish, the buoyant tendency kept up fairly till the close. In the Money Market, there was an excellent demand, and good rates were commanded; but discount was weaker, and inclined to give way. Business in the Gas Market was an exception to the general rule, being unusually active; the animation lasting to Saturday, which, in other lines, was a *dies non*, owing to the counter attractions of sport and pleasure. The tone was also remarkably steady; the total of changes in the London Market amounting to a fractional variation in two issues only. The Provinces, too, exhibited only two small changes. In Gaslight and Coke issues, there were a number of transactions in the ordinary, which changed hands every day at level figures—never outside 87¼-88¼. The secured issues, on the other hand, were rather quiet, but their prices also were quite steady. South Metropolitan opened out with renewed activity after its quiet close the week before; and, marking 118½, it advanced a point. But later on, it began to give way and changed hands as low as 116, and the buying price was dropped a point. In Commercials, there were a few bargains at moderate figures. The Suburban and Provincial group was very quiet. There were no changes in London. Locally, Liverpool "A" recovered a point; but Newcastle was put down half-a-point. The Continental Companies were very inactive and without any change; and the same remark holds good concerning the remoter undertakings. Business in the Water Companies was only moderate, and movements were irregular. New River had a fall of 10 points; and two or three other companies had minor gains or losses.

The changes in quotation were: On Monday, South Metropolitan rose 1. On Tuesday, Lambeth 7½ per cent. gained 1. On Wednesday, New River fell 5; but Kent new rose 2. On Friday, South Metropolitan relapsed ½, and Southwark Water 1. On Saturday, New River was set back 5 more.

ELECTRIC LIGHTING MEMORANDA.

The Districting of the Metropolis for Electric Lighting Purposes—The Alteration of Borough Boundaries—An Electricity Board for London—The Financing of the Marylebone Borough Council.

THE difficulty of districting the electricity supply of the Metropolis upon parochial lines has become more acutely felt since the passing of the Electric Lighting Act, 1882. It was believed at that epoch that the supply of electricity for lighting must be somewhat narrowly localized; and the early successes of the pioneer London Companies went far to justify their opinion. As time passed on, however, and electricity supply undertakings grew and multiplied, while Metropolitan local government systems were committed to the legislative melting-pot and recast, it was found that the respective districtings did not fit. Moreover, some of the most localized of the London undertakings had to go outside their original limits for their bulk supplies, which was not provided for by the legislation of 1882. Consequently, first the London County Council, and afterwards the Board of Trade, awoke to the perception that the chief object of the Act of 1882 and 1888—the eventual absorption of the electric lighting arrangements by the local authorities—was being destroyed piecemeal by this dislocation of the districting. It is well understood throughout the country that supply and public service undertakings which have to do with more than one local authority, find something to say for and against this state of things. Usually, however, it has the result of rendering expropriation difficult to impossible, according to the circumstances. It is a remarkable commentary upon the principle of municipal trading, which political apologists for the system may be left to explain, that no local authority likes being supplied with gas or electricity by another similar authority.

In the exceptional case of the Metropolis, the changes made in the borough boundaries, which came after the Electric Lighting Acts, went far to render impracticable the realization of the municipalizing intention of these statutes. These changes, moreover, were not made by the electricity supply undertakers, who could not therefore be chargeable with originating or be made answerable for repairing any injury caused by them. Consequently, the Board of Trade proposed a measure, which bears the somewhat misleading title of the Electric Lighting (London) Bill, for putting this matter right. The Bill was read a second time last Wednesday, and referred to a Select Committee. The only criticism that need be addressed to it is that it is not an Electric Lighting Bill at

all, and that it does very little more than touch the fringe of the difficulty as to districting which it recognizes. When the Metropolitan area was re-districted for the purposes of self-government, the necessary changes in the electric lighting areas were left to be made by some measure of the kind, to be introduced when convenient. Meanwhile, the development of the industry, and the growth of the interests involved, have progressed beyond the possibility of reduction to the units of the borough areas. Consequently, the present measure merely provides for effecting such small and unimportant alterations as would not justify a local authority or company bringing in a Bill or proceeding by Provisional Order to effect. Some of these small areas are quite well worth having, from the business point of view; and the longer they are left undistributed, the greater the risk of their being "squatted" upon by enterprising persons with small respect for red-tape considerations.

Of course, the main question is whether, having regard to the peculiar circumstances of the Metropolis, it will not be found necessary, when the proper time comes, to take special measures for carrying out the organic conditions upon which the statutory electricity supply of the capital was founded. This means the constitution of an Electricity Board; and that some such expedient will be called for, there is scarcely the shadow of a doubt. The Metropolitan Boroughs are not competent to realize the purchase provisions of the Acts of 1882 and 1888; and unless some public body is created betimes with this object, the sterilizing operation of these statutes will lapse, and freehold vested interests will supersede them. This cannot be desirable, on any grounds. The chief thing to be regarded in the present state of the subject is that nothing shall be permitted to arise afresh which shall either prejudicially affect existing interests, or jeopardize the interest of the community. Plenty of people will profess solicitude that local authorities, or the public, may not suffer from the interference of companies; but the liability to injustice is just as great on the other side. Sir W. Foster, in the course of the debate on the second reading of the Bill, said hard things about the public lighting of London, and rejoiced at the appearance of an attempt to "give uniformity to the supply of a great public want." How a districting Bill is to improve the street electric lighting of London does not appear; but the honourable member's misapprehension is probably attributable to the misleading nature of the title of the measure, already mentioned.

The London County Council have plucked up sufficient courage to agree to the recommendations of the Finance Committee relative to the financing of the Marylebone Borough Council's electricity supply scheme, according to the particulars published in last week's "JOURNAL." This step was only taken, as one may believe, out of consideration of the fact that the Borough Council, by their Bill, proposed to raise the capital required to carry out the award and set the undertaking going, by an independent financial operation. It is notorious that the County Council profoundly disapprove of the ill-considered action of the Borough Council, which has done more than any previous proceeding of the kind to bring the fashion of municipal trading into disrepute. But it is useless to cry over spilt milk. Therefore, with much groaning over the untimely necessity, the County Council conform to the major obligation of keeping control of the supply of capital to this Metropolitan Local Authority; and they will finance it on the customary basis, if the actual raising of the gross amount can be held off until money is cheaper. When this may be is what no man can prophesy. All manner of borrowers are anxiously watching the growth of surplus resources in this country, with the full intention of collecting them at the earliest possible moment. This is not, usually, a good way to obtain what one wants. The existing financial situation is analogous to that of holders of accumulated stocks of commodities against a rise, who watch the market daily and hourly with the intent to unload at the first indication of strength. The analogy must not be pushed too far; because in the case of the trader caught with unrealizable stock, his desire defeats its object. The source of investable money in the country, however, is not affected by any such consideration. Doubtless, in time the supply will begin to flow again; but it must be a matter of pondering among watchers of the course of things monetary, whether the offer of municipal and other highly respectable investments in the past was not excessive for years. A stream can only furnish the supply that is given to it; and it can be overtaxed. There is not the smallest sign that, before the last few months, municipal financiers ever troubled themselves with a thought of where the money they kept borrowing in such rapidly-increasing amounts was to come from. Worst of all, they anticipated their borrowing powers, and drew upon their bankers, until even that source began to respond with difficulty to all the demands upon it, coming as they did from every side at once. It is difficult for such pampered borrowers to moderate their demands, and little less than an outrage to counsel patience to them, while they all know how the reappearance of cheap money is being watched for by other would-be borrowers.

The late Mr. E. C. Berridge, of Cheltenham, who for upwards of forty years was a Director of the Leamington Priors Gas Company (and whose death was lately noted in the "JOURNAL"), left estate valued at £21,082 net.

THE "GLOBE" LIGHT.

"WE claim that this burner is more economical than existing burners, and that it will give a more powerful light." That was the statement with which the inventor introduced to the notice of a representative of the "JOURNAL," at 20, Regent Street, an incandescent burner, which is to be offered under the appellation of the "Globe" light. Such a sweeping assertion as that quoted above was one that required examination; but the means were not present for investigating its accuracy other than for illuminating power the visual test, and for consumption the position of the gas-tap, in comparison in both respects with other well-known makes of burners. Nor had the inventor any authoritative tests to support his declaration. These are promised, and are to be made immediately, which is evidence of a perfect faith in the burner. Let it not be imagined, however, that these remarks are made in any sense in disparagement of the claims. On the contrary. The witnessed performance of the burner leads one to entertain the belief that proper photometrical tests will prove that the duty to be obtained from the new burner, per cubic foot of gas consumed, will be good—in other words, that with (say) a consumption of from 2 to $2\frac{1}{2}$ cubic feet of gas per hour an illuminating power is obtained equal to that realized in some other burners using from $3\frac{1}{2}$ to $4\frac{1}{2}$ cubic feet. In the absence of tests, this is not to be taken as in any way binding; but merely as an expression of opinion.

There is a distinctive feature about this burner in that, by simple means, it can be adapted to quite a variety of positions and objects. Its principal use is as an inverted burner, or it can be fixed with equally good illuminating effect in an inclined or a horizontal position, which renders it very convenient and serviceable for business and decorative purposes. Or again it can be converted, by the application of an ordinary incandescent burner head, to burn upwards with the common type of incandescent mantle. Lighting purposes do not end the application of the burner. The great intensity of the flame (which is substantiated by the few seconds required for the melting of a tough metal wire) enables it to be used as a blow-pipe for jewellers' work; and the same burner can be turned upwards, the globe gallery shifted into position to serve as a support, and a small kettle of water or saucepan be boiled on it. The burner is now being applied to stoves for cooking purposes; but more will be heard about this departure later.

It is, however, in the employment of the burner for lighting that we are more immediately concerned; and inquiry was directed to ascertain the causes which effect the economy and high light-giving power claimed. It is all a question of the proper mixing of the gas and air, and both in a heated condition. The gas is fed by a long conical injector, into a chamber of globular form. The injector has only one small aperture, instead of three or more, for the exit of the gas; and it follows that the issuing stream of gas must be very limited in amount. The bulbous chamber is constructed with a lower secondary one; and the elongated tube leading to the point of combustion is brought well up into the chamber. Surrounding the upper part of the latter is also a collar for regulating the air supply. But strange to say, under the several conditions in which the burner has been tested, and with varying qualities of gas at different pressures, the regulation of the air supply (so the inventor informs us) has been found unnecessary. The only—if not conclusively convincing—explanation given for this (what must be regarded as a phenomenal experience with inverted burners) is that the construction of the chamber only permits of just sufficient air being drawn in to produce the proper admixture. However, it is to the ample dimensions of the chamber and to its special construction (about which more will be learned when the patent specification is issued) that the excellent performance of the burner is assigned—the arrangement securing a good mixture of the heated air and gas. A favourable feature is the fact that all parts can be readily renewed by the user; and another that wire supports are provided for taking any of the existing types of inverted mantle. The whole of the burner is strongly constructed, and in good style and finish; and in whatever position a number were being used during the inspection, there was not an instance of lighting-back or of any fluctuation of the light. And, moreover, it was perfectly noiseless. These are commendable features. It is intended to bring out a smaller type of the inverted form.

The Coal Commission.—The second report of the Royal Commission on Coal Supplies has been issued as a parliamentary paper. It appears from it that the witnesses examined between Jan. 27 and Oct. 21 of last year dealt principally with possible economies and improvements in connection with the working, preparation, transport, and use of coal, and with the possibility of substituting other kinds of fuel and of adopting power derived from other sources. The Commission state that they are not yet in a position to make recommendations upon the information received, but that the great possibilities of economy indicated by the witnesses, affecting as they do every class and every trade, make it of the utmost importance that the evidence should be carefully studied, not only in the interest of individuals, but in those of the nation as a whole.

DESCRIPTION OF THE MARIENDORF GAS-WORKS OF THE IMPERIAL CONTINENTAL GAS ASSOCIATION.

CONSTRUCTION COMMENCED APRIL 25, 1900, COMPLETED OCT. 21, 1901.

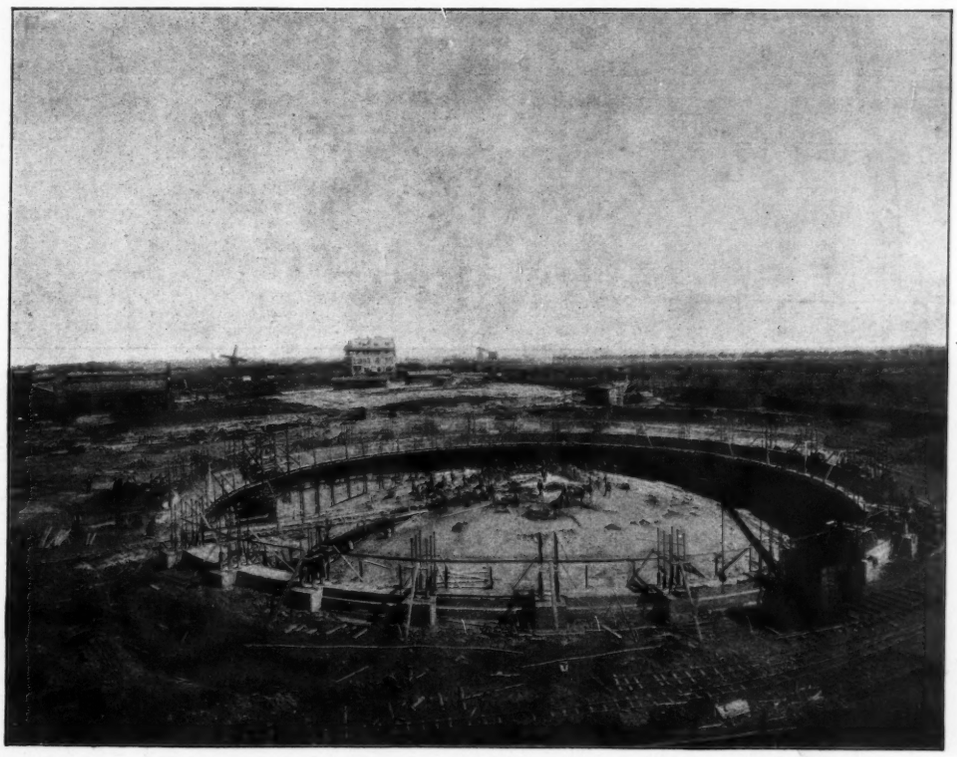
By E. Drory, Chief Engineer, E. Körting, Engineer, and H. Schüller, Clerk of the Works.

(*Concluded from p.* 756.)

The Gasholder Tanks.

The construction of gasholder tank No. 1 had to be undertaken on the lines already indicated, as the gasholder was an old one of 108,000 cubic metres (3,817,000 cubic feet) capacity, which had become superfluous at Vienna, and was to be re-erected at Berlin. A brick or concrete tank, 12·75 metres deep and 63 metres in diameter, similar to the one at Vienna, had therefore to be constructed. No obstacle could be found to the construction, although the ground was very irregularly disposed, and on the whole might be called unfavourable. Clinker bricks in cement were chosen as the building material; brickwork being decidedly lighter than, and equally as efficient as, concrete. The tank was excavated by hand labour, and sheet-piled at the water level. The earth was removed by narrow-gauge railway trucks and a locomotive. This method of working, however, involved some difficulties. The sheet piles refused to penetrate into a very hard clay stratum below the tank level; so that the foundations had to be laid somewhat higher than was originally intended. Furthermore, some quicksand appeared here and there, and obstructed the work of pumping. The period allowed for the entire erection of the holder, inclusive of the ironwork, was the short time between the 1st of May, 1901, and the 1st of October, 1902. It was reckoned that the erection of the guide-framing and holder would occupy about eight months.

The tank had hence to be ready by the 1st of February, 1902.



The Excavation for No. 2 Gasholder Tank.

At the commencement of December, 1901, when the frost made its appearance, the whole of the brickwork proper was, it is true, built up; but the water-tight rendering (the work of many weeks) was still wanting. To overcome this difficulty, the inner framing for supporting the crown was roofed over with wood and tarred felt; and 300 gas-flames were installed, which gave not only light, but kept the temperature at an average of 4° C., and enabled an excellent rendering to be laid down during the winter months.

The construction of the second tank for a holder of 150,000 cubic metres (5,300,000 cubic feet) capacity was carried out in a far more rational manner. With the help of a steam-navvy, which had been used at first to level the ground, the tank was excavated to about two-thirds of its proposed depth. In order to save unnecessary excavation, and to take advantage of the outer passive resistance of the earth, the lowest one-third of the tank-wall was built between sheet-piling, while the ground-water was kept down by a number of artesian wells.

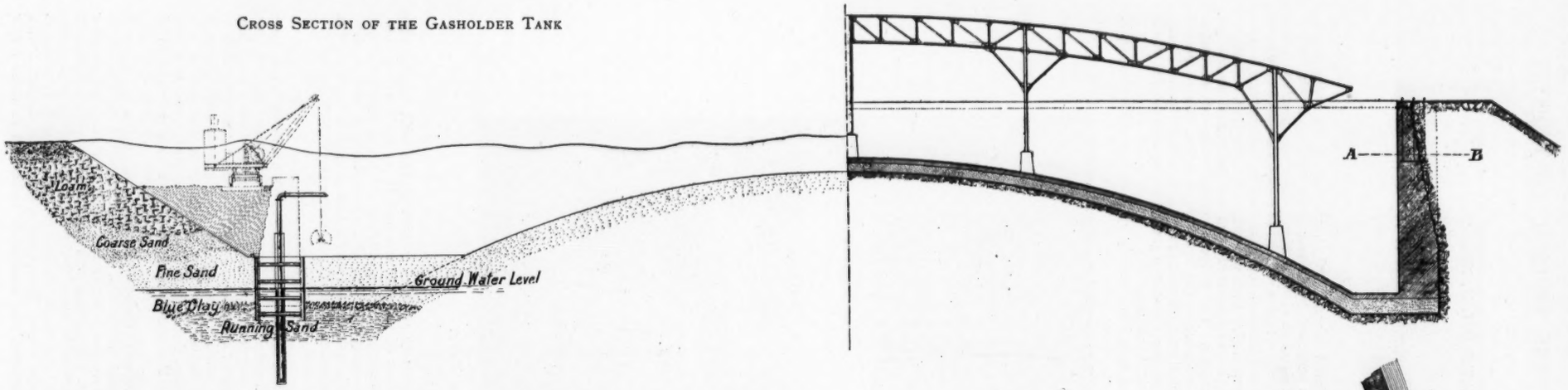
A statical calculation of the brick wall of a tank, 74 metres diameter and 13 metres depth, was conducted, in view of the conditions of soil and mode of excavation, on the assumption that the lower 3·40 metres of the wall should rely on passive earth-pressure, but the upper part of the wall on active earth-pressure as the equalizing factor against pressure of water. In carrying out the excavation of the gasholder tank, the upper 9·60 metres portion of the earth was removed according to the line of the natural angle, and thrown up again after the wall was built, whereas the lower 3·40 metres of the wall was backed by the earth cutting. The method of calculating the stability which was adopted offered a fairly wide security against inadmissible strain, as well as abrasion of the brickwork; and it was specially chosen on account of the irregular strata and general character of the building land.

The Gasholder.

The re-erection of the gasholder—which had been taken down in Vienna, and which, with its capacity of 108,000 cubic metres, is the largest as yet erected on the Continent—was a very difficult piece of work; every little irregularity and misfitting parts of the holder and framing having to be most carefully and repeatedly measured and controlled. This problem was, however, so ably solved by Messrs. Cutler and Sons, the original builders of the holder in 1891, that hardly a screw or rivet was required to be altered.

The construction of the scaffolding for the erection of the guide-framing was both simple and new. It consisted of four poles, placed one above the other and connected by an equal number of cross-pieces. The holder was first riveted together, then with the help of a moveable crane, the lowest section of the guide-framing was erected; and finally the holder was filled with air as far as the framing would allow. The plates of the crown supported with ease railway sleepers and concentric rails; and on these a pair

Cross Section of the Gasholder Tank



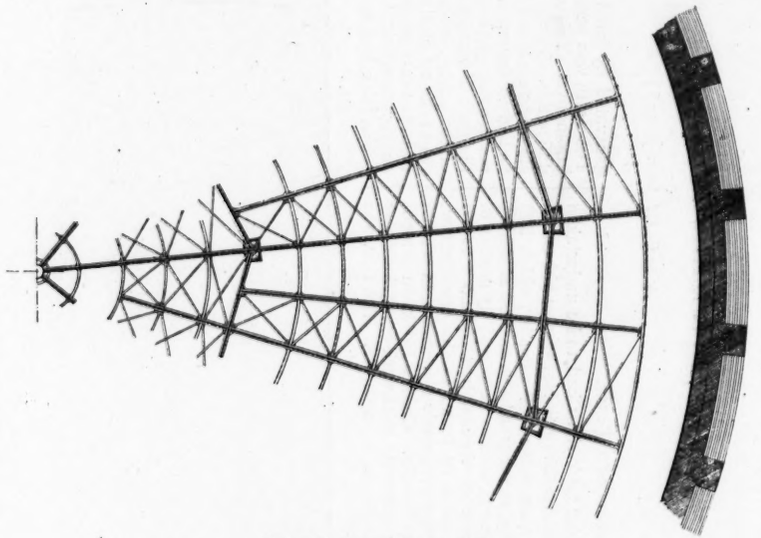
of double "legs," moved on rollers—being held down by wire-ropes. These legs lifted the standards and connections lying at the edge of the tank, and brought them to their respective places. When the second section was set up, the holder was blown further up, and the third section commenced, &c.

Cost of the Works—See Table, p. 832.

The planning of these gas-works was, as has previously been remarked and explained, worked out altogether on large lines. Consequently, there are many headings in the recapitulation of cost—such as, for instance, land and railway connections—which are absolutely disproportionate to the present productive capacity of the works, and, if uncritically compared, would give an entirely false idea of the capital outlay necessary for a modern gas-works. For this reason, a special column (No. 2) has been formed in the table, which shows for every separate installation, for how large a production of gas per day it suffices. In column No. 3 follows the actual cost. Finally, column No. 4 contains the quotients $\frac{\text{Column 3}}{\text{Column 2}} \times 1000$ m., and gives an approximately correct picture of the relative dimensions of the separate costs of installation, with due regard to the working capacity. The sum of these quotients shows the total cost of the works for a given average possible production of gas; the extent of this possible production being arrived at by dividing $\frac{\text{Annual Total Cost}}{\text{Sum of Quotients}}$.

The table shows, to begin with, the interesting fact that the average working capacity is quite double as large as the one actually extant. The average cost per 1000 cubic metres of maximum daily production is 43,782 marks, or about 22 pfgs. per cubic metre of yearly production. The actual cost is 88,683 marks and 44 pfgs. respectively. Neither of these figures can be considered too high; but there is unquestionably much room for economizing. For instance, the retort-house, with its 27 per cent. of the total cost, calls loudly for a new system of gas production. The purifier-house, too, with its 7½ per cent., is a subject for thought, and can, moreover, be built decidedly cheaper, especially as the probabilities indicate that revivifying space will be superfluous at some future date.

A very heavy item is for gasholders; but even here are signs of improvement, if the cost of the gasholder tanks Nos. 1 and 2 are compared. It must, however, be remarked that in tank No. 2 a part of the cement rendering—valued at about 15,000 marks—is still wanting, as well as the iron framework to support the crown (30,000 marks). Nevertheless, No. 2 will hardly cost as much as No. 1, although one-and-a-half times as large, The consequences of hurried work are noticeable in No. 1;



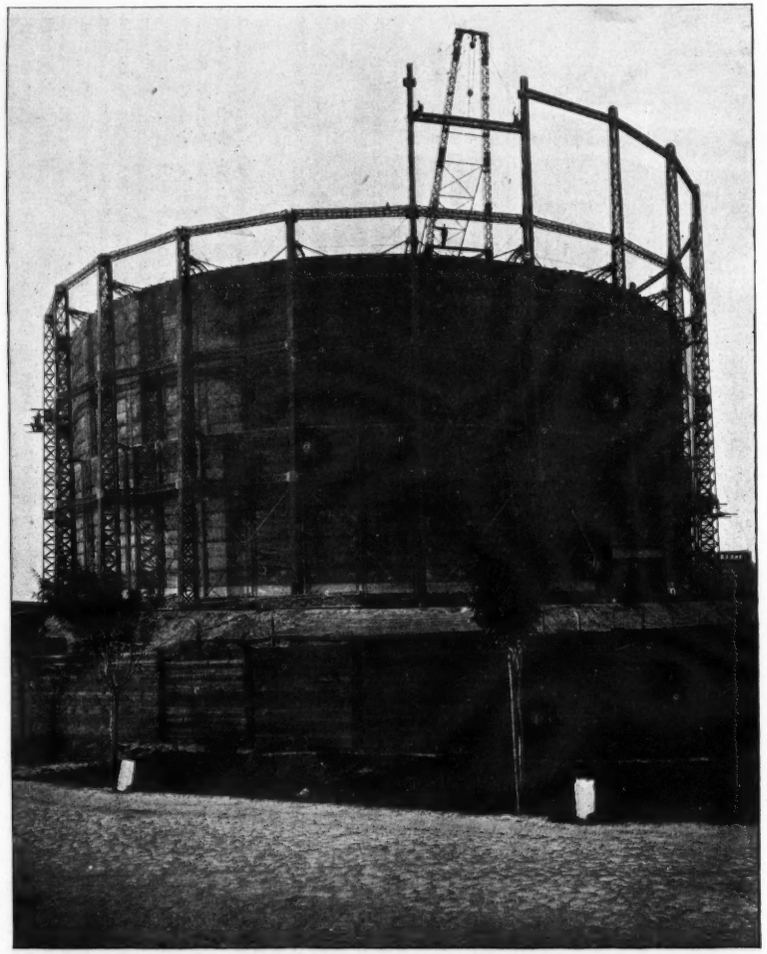
Plan on the Line A.B.

while there will be the tangible benefits in the larger piece of work, calculated at leisure and carried out by the best mechanical means, in No. 2.

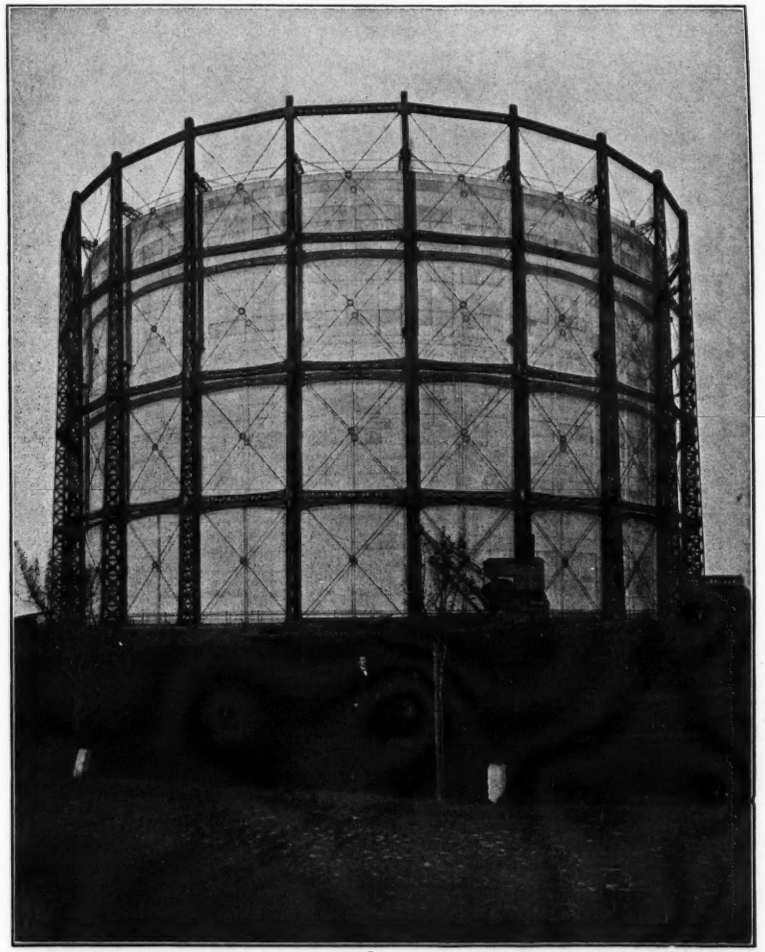
The low cost of the coal storage is explained by the provisional character of the plant; the definite arrangement being also prospectively kept within moderate limits.

The outlay for the welfare of the workmen may, however, be termed low, in comparison to the benefits it confers.

When a municipality or a board of directors demand of their engineers that they should



THE VIENNA HOLDER BEING RE-ERECTED AT MARIENDORF.



THE HOLDER AS RE-ERECTED.

construct with rapidity, and be ready at short notice, they must also be prepared to relinquish a small percentage of their right of voting money, in favour of immediate decisions on the part of the engineer. Otherwise, valuable time will be lost in endless negotiations over comparatively small grants. Had the Board of Directors of the Imperial Continental Gas Association not been consideration itself, the vast work at Mariendorf could never have been terminated, as it was, within the short space of eighteen months.

A comparison of the cost of a modern and an old-fashioned gas-works is also most instructive.

After careful examination, we believe every one will find that, for a given yearly production, the cost of installation has not increased; but that the capacity of the works—in regard to exact methods, extracting the utmost from the raw materials, rapid conveyance, and the preparation of the bye-products, as well as far-reaching restriction of hand labour—shows a very notable increase. There are, moreover—look where one will—so many incitements to fresh progress that we gas engineers may well look forward with confidence to a continued prosperous development of our industry.

COST OF THE MARIENDORF GAS-WORKS TO JAN. 1, 1903—SEE P. 830.

—	Sufficing for a Gas Production per 24 Hours of	Cost. Separately.	Cost. Total.	Cost per 1000 Cubic Metres of Gas Produced in 24 Hours, All in Action. Separately.	Total.	Separately.	Total.
	Cubic Metres.	£ s. d.	£ s d.	£ s. d.	£ s. d.	P. Ct.	P. Ct.
Purchase of land—78 ha = 192 acres	1,500,000	143,633 11 4		95 14 0		4·5	
Earthwork—Excavation and levelling, exclusive of railway embankment	500,000	6,151 17 9		12 6 0		0·6	
Fencing—Wire netting and wood	1,500,000	1,403 9 8		19 0		0·0	
Street paving	500,000	5,867 6 6		11 14 7		0·6	
Water supply—Water-tower, wells, and pumps	250,000	2,157 17 8 1,292 13 5		13 15 9		0·7	
Drainage, mainly above ground	250,000	3,404 4 5		13 13 0		0·6	
Railway connection—Marienfelde to gas-works siding at Marienfelde Station	1,000,000	20,579 5 0		20 12 0		0 9	
Railway station and rails on works, inclusive of embankments, drainage of bog, &c.	1,000,000	29,156 15 3		29 2 10		1·3	
Adaptation of the land to the purpose of a gas-works	1,080,000	213,647 1 0	213,647 1 0	197 17 2	197 17 2	9 2	9·2
Retort-house, including furnaces, coal breaker, elevators, conveyors, hoppers, and De Brouwer troughs in the house	120,000	69,045 19 0		575 8 0		26·8	
Apparatus-house No. 1	180,000	4,049 9 6		22 10 3		1·0	
,, ,, No. 2	270,000	3,820 0 0		14 3 5		0·7	
Exhausters, tar, naphthalene, cyanide, ammonia, washers, condensers, and all connecting-pipes	200,000	22,444 3 4		112 3 3		5·2	
Purifier-house	120,000	7,645 9 10		63 14 10		3·0	
Purifiers with centre-valves and connections	120,000	11,372 18 8		94 15 6		4·4	
Boiler-house	120,000	2,782 12 5		23 3 10		1·1	
Steam-boilers	120,000	2,867 5 3		23 17 10		1·1	
Pipes on the works, with the exception of connections in the apparatus-houses	120,000	12,799 4 1		106 12 7		5·0	
Gas, water, tar, ammonia, cyanide, creosote, steam-pipes, pipe-trench, and overhead loading station	240,000	11,077 16 0		46 2 8		2·2	
Gas production and purification	136,000	147.904 18 1	147,904 18 1	1,082 12 2	1,082 12 2	50·5	50·5
Station meter and governor house	450,000	4,062 15 4		9 0 6		0·4	
Station meters and governors	300,000	5,362 18 11		17 17 3		0·8	
Gasholder tank No. 1—Minimum available contents of gasholder = 60 per cent. of maximum daily production	180,000	36,298 8 0		201 13 7		9·4	
Gasholder tank No. 2	250,000	33,130 16 1		132 10 3		6·2	
Gasholder No. 1 = 108,000 cubic metres	180,000	31,105 1 8		172 15 3		8·1	
Gas measuring, storing, and distribution	206,000	109,960 0 0	109,960 0 0	533 16 10	533 16 10	24·9	24·9
Coal-store (provisional)	120,000	2,892 14 8		24 2 5		1·1	
Narrow-gauge railway	120,000	1,203 14 6		10 0 0		0·5	
Coke conveying, preparation, and storing (in the open)	120,000	8,178 2 5		68 3 10		3·2	
Tar and ammoniacal liquor tanks, small pump-houses	180,000	7,047 1 0		39 3 5		1·8	
Handling of raw materials and bye-products	136,000	19,321 12 7	19,321 12 7	141 9 8	141 9 8	6·6	6·6
Office and dwelling-house	360,000	6,011 0 0		—		—	
Coke sale offices	..	256 10 5		17 8 2		0·8	
Workshops	240,000	3,422 9 2		14 5 5		0·7	
Bath and dining-house for stokers	120,000	2,393 13 2		19 18 5		0·9	
,, ,, ,, yard labourers	240,000	4,160 2 9		17 6 2		0·8	
Water-closets	120,000	463 19 5		3 16 9		0·2	
Trees and shrubs	120,000	193 2 8		1 12 7		0·1	
Alteration of an old building as foreman's dwelling	120,000	520 0 0		4 6 4		0·2	
Builder's office	120,000	263 10 5		2 4 2		0·1	
Management, upkeep, and workmen's institution	219,000	17,684 8 0	17,684 8 0	80 18 0	80 18 0	3·8	3·8
General expenses and sundries	120,000	13,147 8 9	13,147 8 9	109 11 5	109 11 5	5·0	5·0
Total for the whole existing gas-works	Average 243,000	..	521,665 8 5	..	2,146 5 3	..	100 0

PERSONAL.

Last week Mr. A. A. Johnston, the Manager of the Ilford Gas Company, presented to Mr. A. E. RATCLIFF, on behalf of the staff and employees, a handsome portmanteau and dressing-case, on his leaving Ilford for York, having been appointed inspector to the York United Gas Company.

In the "JOURNAL" for the 15th inst. it was stated that Mr. S. B. LANGLANDS had resigned the post of Gas Manager at Coleraine to take up an appointment at Glasgow. We now learn that he is to occupy the position of Manager of the Gas-Stove, Meter, Fitting, &c., Department of the Glasgow Corporation, in terms of an advertisement that recently appeared in the "JOURNAL."

The great esteem entertained for Mr. FLETCHER W. STEVENSON, the Engineer and General Manager of the Coventry Corporation Gas Department, by the members of the staff, found expression on Saturday last in the presentation of a solid silver rose bowl, in commemoration of his silver wedding. It bore the following inscription:

> Presented to Fletcher Wilson Stevenson, Esq., Engineer and General Manager, Coventry Corporation Gas Department, by the Staff, on the occasion of his Silver Wedding, as a mark of esteem and appreciation. March 19, 1904.

The presentation was made by Mr. A. L. Newbold, the oldest official in length of service, who referred in complimentary terms to the high appreciation in which Mr. Stevenson is held by the whole of the staff. Other congratulatory speeches having been made, Mr. Stevenson suitably acknowledged the gift.

An interesting ceremony took place at the general offices of the Sheffield Gas Company last Thursday evening, when Mr. J. J. JACKSON, on retiring after 43 years' service, was the recipient of a gold chronometer, &c., subscribed for by the officials of the Company. Mr. Hanbury Thomas, the General Manager and Secretary, in making the presentation, referred to the great progress the Company had made during the time Mr. Jackson had been in their service, and also to the continued prosperity of the undertaking. He likewise expressed his satisfaction at the good feeling existing among the members of the staff during the time he had been with them.

On Saturday, a very interesting ceremony was performed at the "Golden Fleece," High Wycombe, when Mr. W. W. MORRIS (who has been employed for some time as meter-tester at the Wycombe Gas-Works) was the recipient of a purse of money from the employees. Mr. Morris, who is a son of the Manager of the Maryport Gas-Works, is shortly proceeding to Australia in order to take up an appointment as Manager under the Colonial Gas Association, and his fellow-employees, as a token of esteem and goodwill, made him the presentation referred to. The ceremony was performed by Mr. H. H. Parker, the Chief Clerk, who, in suitable terms, referred to Mr. Morris's kindness to all since he had been in the town. These remarks were endorsed by Mr. Jeffreys (who acted as Secretary to the fund) and by Mr. J. C. Hale, the resident foreman. Mr. Morris, in equally appropriate terms, returned thanks, and remarked that he should never forget the kindness of those with whom he had worked at Wycombe.

ACCOUNTS OF THE METROPOLITAN GAS COMPANIES FOR THE YEAR 1903.

—	Chartered.	Commercial.	South Metropolitan.	All the Companies.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Capital and borrowed money (including premium capital)	27,553,847 11 9	2,443,970 16 3	7,982,700 0 0	37,980,518 8 0
Income—viz.:				
Total gas rental	3,053,804 9 11(a)	348,666 5 6(d)	1,310,270 6 10(f)	4,712,741 2 3
Rental of meters and stoves	59,822 2 1(b)	24,443 15 0	99,302 15 6	183,568 12 7
Residual products	863,416 14 7	115,406 10 8	536,506 0 10	1,515,329 6 1
Miscellaneous, including old materials	17,068 12 3	1,132 17 8	13,360 5 1	31,561 15 0
Total income from all sources	3,994,111 18 10	489,649 8 10	1,959,439 8 3	6,443,200 15 11
Expenditure—viz.:				
Coal and oil, including carriage and dues	1,295,415 9 0	171,424 5 3	674,712 8 0	2,141,552 2 3
Purifying materials, including labour	97,676 14 1	15,200 16 10	40,887 15 9	153,765 6 8
Salaries and wages—manufacture	316,152 17 11	39,844 10 6	141,336 5 4	497,333 13 9
Wear and tear—manufacture	355,460 5 5	54,392 15 9	241,544 0 7	651,397 1 9
Rents, rates, and taxes	287,219 9 2	18,601 11 1	78,268 11 6	384,089 11 9
Salaries—management	23,373 12 11	2,176 2 6	6,078 15 4	31,628 10 9
Collectors' salaries and commission	40,405 12 5	4,898 16 8	21,754 15 9	67,059 4 10
Stationery, printing, and general charges	21,804 19 5	3,550 8 9	19,619 16 3	44,975 4 5
Directors and auditors	5,931 10 0	2,650 0 0	5,289 17 0	13,871 7 0
Salaries and wages, wear and tear—distribution	203,416 18 6	18,733 5 11	133,796 16 5	355,947 0 10
Repair and renewal of meters and stoves, &c.	114,913 7 4	18,655 12 8	97,433 0 4	231,002 0 4
Law and parliamentary charges	6,895 16 9	963 8 7	4,027 0 7	11,886 5 11
Bad debts and extraordinary expenses	58,073 9 2(c)	9,540 11 6(e)	47,346 16 1(g)	114,960 16 9
Total expenditure on revenue account	2,826,740 2 1	360,632 6 0	1,512,095 18 11	4,699,468 7 0
Gross profit	1,167,371 16 9	129,017 2 10	447,343 9 4	1,743,732 8 11
Do. per cent. on capital and borrowed money	4 4 9	5 5 7	5 12 1	4 11 10
Do. do. gas-rental	38 4 6	37 0 0	34 2 10	37 0 0

(a) Including £150,378 received for public lighting and gas supplied by contract. (b) Stoves only. (c) Including annuities, £33,017, £1384 on workmen's compensation account, and £10,049 stamp duty on increase of nominal capital. (d) Including £16,004 (less discounts and allowances) for public lighting, &c. (e) Including £5097 paid under profit-sharing scheme. (f) Including £58,441 for public lighting, &c. (g) Including £10,926 paid to pension, &c., funds, and £32,017 under co-partnership scheme.

TABLE *showing the Capital, Income, Expenditure, and Profit, per Ton of Coal Carbonized (including Oil), in* 1903.

—	Chartered.	Commercial.	South Metropolitan.	All the Companies.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Capital and borrowed money	13 15 2·62	9 12 4·42	6 19 11·94	11 3 7·46
Income—viz.:				
Total gas rental	1 10 6·03	1 7 5·33	1 2 11·74	1 7 8·98
Rental of meters and stoves	7·17	1 11·09	1 8·90	1 0·97
Residual products	8 7·48	9 1·00	9 4·90	8 11·06
Miscellaneous, including old materials	2·05	1·07	2·82	2·23
Total income from all sources	1 19 10·73	1 18 6·49	1 14 4·36	1 17 11·24
Expenditure—viz.:				
Coal and oil, including carriage and dues	12 11·27	13 5·92	11 9·99	12 7·31
Purifying materials, including labour	11·71	1 2·36	8·61	10·87
Salaries and wages—manufacture	3 1·89	3 1·63	2 5·75	2 11·14
Wear and tear—manufacture	3 6·61	4 3·38	4 2·83	3 10·03
Rents, rates, and taxes	2 10·43	1 5·57	1 4·47	2 3·14
Salaries—management	2·80	2·06	1·28	2·24
Collectors' salaries and commission	4·84	4·63	4·58	4·74
Stationery, printing, and general charges	2·61	3·35	4·13	3·18
Directors and auditors	0·71	2·50	1·11	0·98
Salaries and wages, wear and tear—distribution	2 0·38	1 5·69	2 4·16	2 1·15
Repair and renewal of meters and stoves, &c.	1 1·77	1 5·62	1 8·50	1 4·30
Law and parliamentary charges	0·83	0·91	0·85	0·84
Bad debts and extraordinary expenses	6·96	9·01	9·96	8·12
Total expenditure on revenue account	1 8 2·81	1 8 4·63	1 6 6·22	1 7 8·04
Gross profit	11 7·92	10 1·86	7 10·14	10 3·20

TABLE *showing the Increase or Decrease in each Item during* 1903 *compared with* 1902.

—	Chartered.		Commercial.		South Metropolitan.		All the Companies.	
	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.	Inc.	Dec.
	£	£	£	£	£	£	£	£
Capital and borrowed money	..	..	1,289,513	..	202,700	..	1,492,213	..
Income—viz.:								
Total gas rental	..	74,327	..	12,489	24,122	..	..	62,694
Rental of meters and stoves	4,054	..	4,153	..	8,782	..	16,989	..
Residual products	68,434	..	21,794	..	48,963	..	139,191	..
Miscellaneous, including old materials	..	2,907	..	201	4,225	..	1,117	..
Total income from all sources	..	4,746	13,257	..	86,092	..	94,603	..
Expenditure—viz.:								
Coal and oil, including carriage and dues	..	110,588	..	6,583	..	42,354	..	159,525
Purifying materials, including labour	..	3,080	..	389	..	643	..	4,112
Salaries and wages—manufacture	..	14,126	..	1,735	..	3,210	..	19,071
Wear and tear—manufacture	..	19,155	12,602	..	44,557	..	38,004	..
Rents, rates, and taxes	..	3,476	611	..	5,560	..	2,695	..
Salaries—management	287	..	..	588	514	..	213	..
Collectors' salaries and commission	..	3,141	436	..	1,132	..	..	1,573
Stationery, printing, and general charges	837	..	360	..	..	867	330	..
Directors and auditors	..	4	..	..	1,371	..	1,367	..
Salaries and wages, wear and tear—distribution	22,602	..	3,348	..	21,007	..	46,957	..
Repair and renewal of meters and stoves, &c.	..	19,515	3,195	..	15,584	..	..	736
Law and parliamentary charges	3,175	..	..	1,354	..	2,334	..	513
Bad debts and extraordinary expenses	4,607	..	..	3,956	..	5,826	..	5,175
Total expenditure on revenue account	..	141,577	5,947	..	34,491	..	..	101,139
Gross profit	136,831	..	7,310	..	51,601	..	195,742	..

PRESENTATION TO MR. ALFRED COLSON.

The members of the staff of the Leicester Gas and Electric Lighting Department and the workmen who served in connection with the late South African War, last Wednesday evening expressed, in a very gratifying way, their appreciation of the manner in which Mr. Alfred Colson, the Engineer and Manager, had safeguarded their interests while away, by looking after their families and securing for them the grant of half their average wages. A meeting took place at the Aylestone Gas-Works, at which Mr. Colson was presented with a silver Irish loving-cup, bearing the following inscription:—

> To Alfred Colson, Esq., M.Inst.C.E., M.Inst.E.E.—From the members of the staff and the workmen of the Corporation of Leicester gas and electric light undertaking who served in the South African War, 1899-1902. In gratitude for generous thought and interest.

In making the presentation on behalf of the officers and men, Sergeant-Major Charlton, R.E., remarked that no fewer than 78 of them served under the colours—59 going to South Africa and the remainder doing garrison duty at home and in Egypt. The men were divided among 27 different regiments; so that the Leicester Gas-Works were represented in all the most important engagements. While they were away, it was a great satisfaction to them to know that, not only were their own interests being safeguarded, but also the welfare of those nearest and dearest to them. Perhaps the best of Mr. Colson's arrangements was the formation of the Soldiers' Fund, which was generously supported by the officials and men of the department; the result being that the men's wives and children benefited to the extent of £322. While acknowledging the kindness of the Gas Committee, the men could not but feel that their thanks were mainly due to Mr. Colson for the kindly sympathy he had always shown them, and for the way in which, when they came home, they were allowed to resume their old duties. Mr. Colson not only helped them in this manner, but he also sent his son (Lieut. Douglas Colson, R.E.) to the front; and a very gallant comrade he made. He had much pleasure in asking Mr. Colson to accept the cup, with the best wishes of all the active-service men.

The cup having been handed to him, Mr. Colson said when he came into the room he had no idea that anything of the kind was in store for him. They had carried out all the arrangements with the utmost secrecy; and he was perfectly staggered when presented with the beautiful cup. He thanked them from the bottom of his heart; and it would always remind him of those who went to serve their country in South Africa. They were all proud of these men. He could not help remembering, however, the way in which the Gas Committee acted. They were most generous; and to all the suggestions he (Mr. Colson) laid before them, they gave their hearty sympathy and aid.

PRESENTATION TO MR. JOHN BOOTH.

In connection with the resignation of Mr. John Booth, the Gas Engineer to the Southport Corporation, a presentation to him of a handsome silver rose-bowl took place last Thursday. Mr. Kenyon, who had been associated with Mr. Booth at the Southport Gas-Works for 25 years, said that a few months ago Mr. Booth decided to retire from the position he had held for a quarter-of-a-century, during which period the work of the Gas Department had very materially increased. If they took the make of gas for the year just ending, he thought it would show an increase of about 160 per cent. over the first year of his management there. They thought this would be a fitting time to show their appreciation and regard for Mr. Booth, and to place on record the kindness and courtesy they had always received at his hands. He hoped both Mr. and Mrs. Booth might be spared many years to enjoy the fruits of their labour. They felt very much the severance that was about to take place. Mr. Blundell heartily agreed with the sentiments expressed by Mr. Kenyon. Their associations with Mr. Booth had at all times been of the happiest; and the good feeling which had existed made the parting extremely hard. Mr. Johnson and Mr. Nevill also made some appreciative remarks; the former stating that the dominant note in Mr. Booth's 25 years' service was "diligence in business," and he had ever been an example to them in this respect. Mr. R. Walmsley, the Deputy-Manager, thoroughly endorsed what had been said by the previous speakers, and expressed the pleasure it afforded him to present Mr. Booth, on behalf of the staff, with the bowl. The gift bore the following inscription:—

> Presented to John Booth, Esq., by the Gas-Works Officials, on the occasion of his retirement, after 25 years' service as Gas Engineer to the Southport Corporation. March 24, 1904.

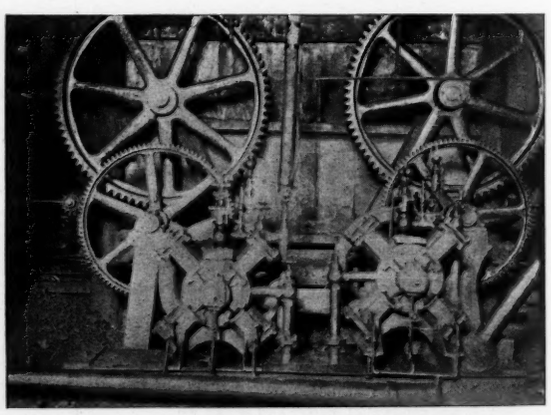
Mr. Booth, in reply, said he had felt the parting acutely. He had been associated with some of them for 25 years; and he felt it very hard that his official life with them would shortly cease. They had all been good, true, and faithful. Whenever a call had been made for extra work, they readily responded; and if they came to look back on 25 years, as Mr. Kenyon had remarked, the growth of the Southport Gas-Works had been very great.

CHARGING THREE RETORTS SIMULTANEOUSLY AT THE TORONTO GAS-WORKS.

The Bronder Machine.

It is useless to attempt to predict where advance is going to stop in respect of retort-house machinery. Improvement is surrounding us on all sides. We have in this country arrived at the stage where there are a variety of machines that can by one operation charge a retort in a few seconds. On the one man and the few seconds it seems impossible to improve; and, therefore—if this is really so—the next step forward in economy must be in some other direction. Though perhaps it has not been fully appreciated from the somewhat ambiguous method of description, Mr. G. A. Bronder, of New York, has pointed one way in the patent specification of his latest invention from which extracts and illustrations were given in the "Journal" for Jan. 26 last. That way is in the simultaneous charging of a number of retorts greater than one. The description and illustrations alluded to do not convey this very acutely to the mind's eye. But, in fine, what Mr. Bronder is there proposing is the charging of three retorts at a time. The idea has already got beyond drawing and specification; and to-day machines on this system are actually part and parcel of the retort-house plant at the works of the Toronto Consumers' Gas Company—tiers of retorts are there, it appears, now being regularly drawn and charged three at a time. This peculiarly interesting fact has been brought to knowledge by Mr. Sydney Y. Shoubridge, the Engineer of the Crystal Palace District Gas Company; and it is to him that, with ourselves, readers of the "Journal" are indebted for the photographs on the opposite page, showing these marvellous pieces of mechanical ingenuity in operation at Toronto. The photographs were sent to Mr. Shoubridge from Toronto by a friend; and he, in turn, has forwarded them to us with permission to reproduce them.

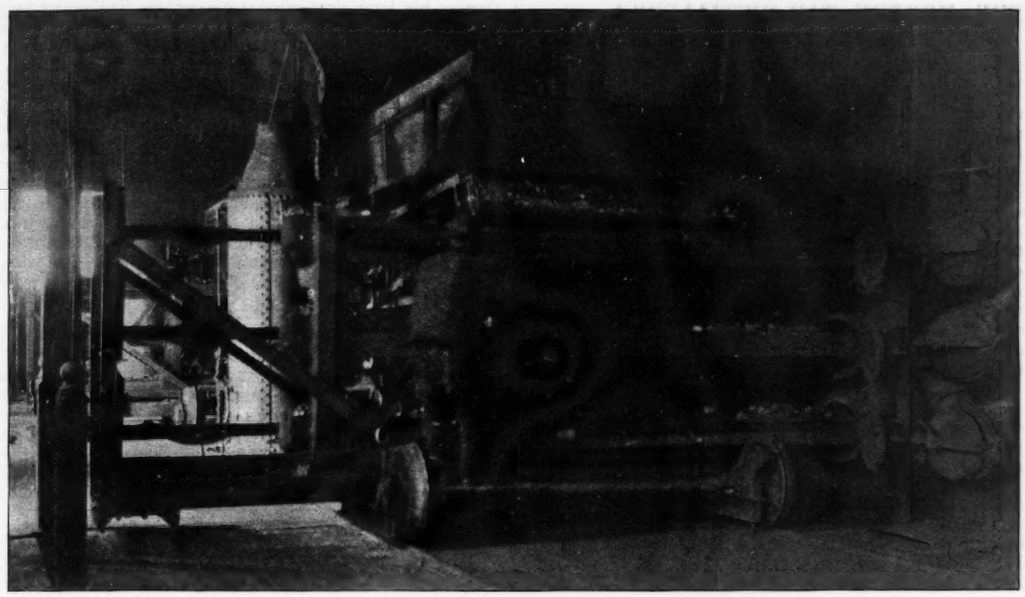
The first photograph is perhaps the most interesting, inasmuch as it clearly shows the three scoops of the charging-machine laden with coal, and about to enter the retorts. The second photograph gives a back view of this triple-scooped charger. The retorts in the house are through ones; and the machine in one operation—occupying only 40 seconds—charges half of the length of three retorts. Then the third photograph gives a back view of the mechanical drawer, which also relieves three retorts at a time of their spent charges. There is nothing that can be said at present by way of extension of the description of this new type of machine as published from the patent specification in our issue of Jan. 26. Denuding that description of the patent verbiage and detail, it is seen that there are two special features in connection with the charging-machine in addition to its capability of dealing with three retorts at once. The scoops are each provided with frames from which are pivoted scrapers, which, on the scoop receding, empty the charge into the retort. Furthermore, there is a lifting plough secured to each scoop, by means of which the coal is lifted as it leaves the scoop, and is piled up against the sides of the retorts, leaving a channel running longitudinally through the charge. Readers can gather for themselves the details of the mechanism by which these various operations are accomplished by reference to the previous publication.



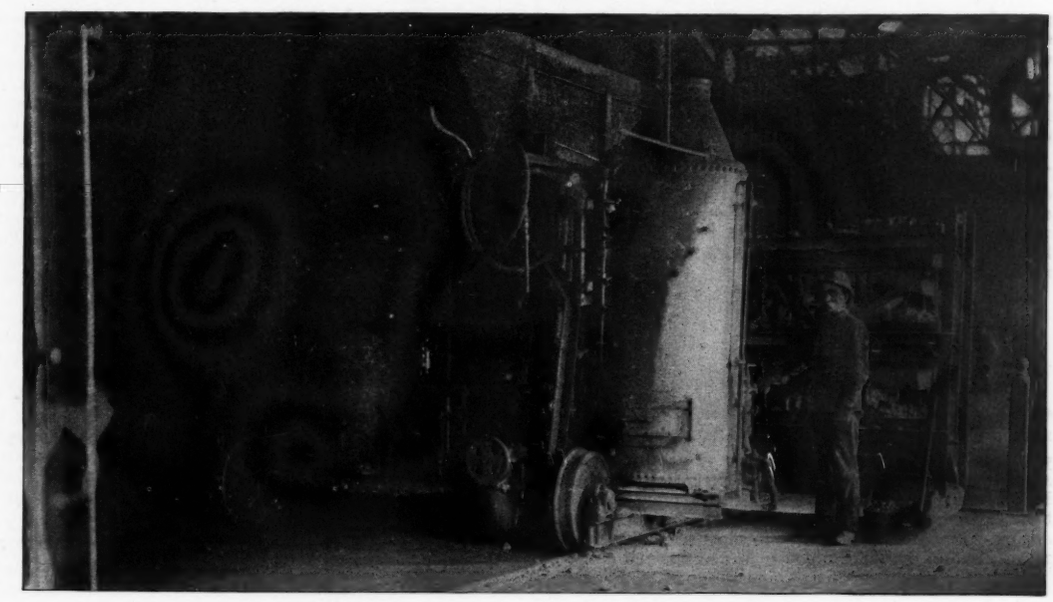
Four-Cylinder Steam-Engine for Coke-Conveyor.

The above small photograph is likewise novel for English gas engineers. It is a view of a four-cylinder steam-engine, which is applied to the driving of a bucket coke-conveyor running in front of the retort-benches at the same works of the Toronto Company.

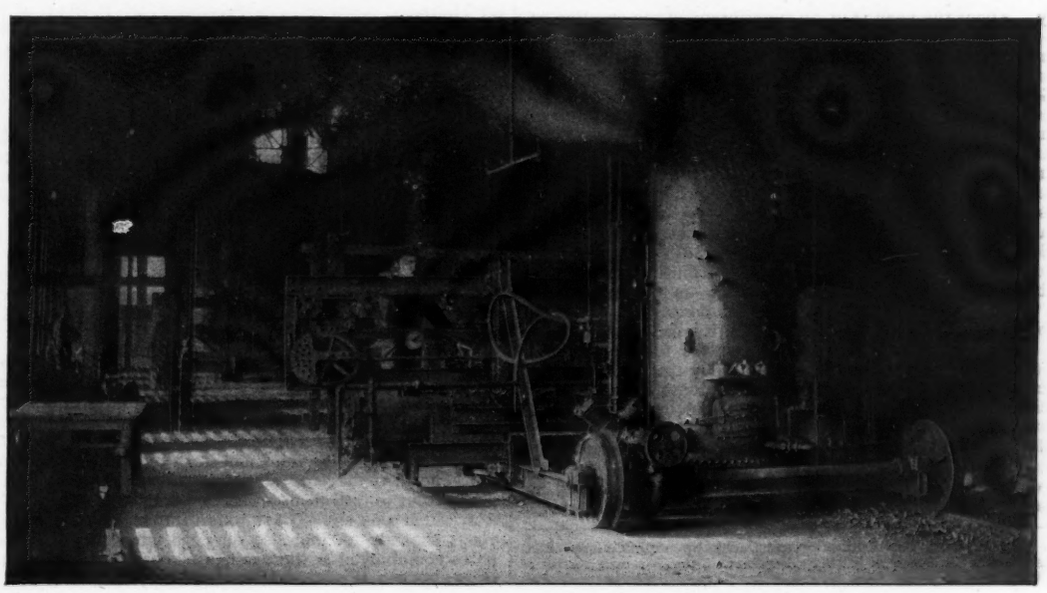
CHARGING THREE RETORTS SIMULTANEOUSLY AT THE TORONTO GAS-WORKS (SEE OPPOSITE PAGE).



FRONT VIEW OF THE MECHANICAL TRIPLE-SCOOPED CHARGER AT TORONTO.



BACK VIEW OF THE TRIPLE-SCOOPED CHARGER.



BACK VIEW OF MECHANICAL DRAWING-MACHINE FOR THREE RETORTS.

THE MODERN TAR-DISTILLERY.*

THE latest addition to the important series of chemical and technical text-books published by the well-known firm of A. Hartleben deals with the construction and disposition of a modern tar-distillery. Incidentally, also, it treats of the distillation of tar and the nature of the commercial products directly obtained from it, as well as of some secondary products and articles of considerable commercial importance which are commonly produced at tar-works. The author, Herr W. Peterson-Kinberg, aims at presenting a concise account of a modern tar-works, both in construction and use, and does not pretend to discuss numerous varieties of each description of apparatus. He selects the particular variety which seems to him best adapted for its purpose, and at once proceeds to dilate upon the practical application of it. The scheme of arrangement of the apparatus on the works is substantially of his own conception, and is perhaps more in keeping with German than with English ideas of tar-works equipment. The scale on which his scheme is planned is that of a moderate sized works, capable of dealing with about 10 tons of tar per diem, The book appears to be carried out faithfully on these lines, and it is throughout brimful of information. It should meet with a ready appreciation by tar-works managers and employees, as it seems to embody the fruits of the author's own experience, and not to be merely a compilation from the larger handbooks on coal tar and its products.

The subject is so closely akin to the gas industry, that we may appropriately indicate more precisely the nature and contents of Herr Peterson-Kinberg's text-book by giving the headings of the eleven chapters into which its 222 pages are divided. Exclusive of these chapters, there is an introduction, in which the more important derivatives of tar are traced from it; and the general arrangement of a tar-works is indicated. Then follows the so-called first chapter, in which the apparatus required in the distillation of tar is described. The second chapter deals with the mode of working the tar-stills, and then follow chapters devoted to the several distillates in order of their production. Thus the third chapter treats of the first runnings and light oil, the fourth of the carbolic oil, the fifth of the heavy oil and naphthalene, the sixth of anthracene oil and anthracene, and the seventh of pitch. The eighth chapter explains the manufacture of roofing felt, the ninth that of the so-called "asphalt" pipes, and the tenth the production of various "prepared" tars and tar oils having special applications. The eleventh chapter, which is the last, deals with the tar-works' laboratory. The book concludes with a satisfactory index.

OBITUARY.

ALEXANDRE ARSON.

THE issues of our French contemporaries which have lately come to hand contain the announcement of the death, at the advanced age of 85, of M. Alexandre Arson, who for 37 years filled the important position of Chief Engineer of the Paris Gas Company. Deceased was born in Paris in 1819, and after having attended classes at the Conservatoire des Arts et Métiers, he entered the Ecole Centrale. This establishment he left in 1841 with an engineer's diploma; and in the following year he commenced his professional work in the machine-construction shops of M. Pauwels, at St. Denis. He soon afterwards obtained an appointment as engineer in the gas-works of the Pauwels and Dubochet Company in Paris; and this brought him into connection with the gas industry. About the year 1847, he superintended the erection of the gas-works at Soissons, Epernay, and Bar-le-Duc. When the amalgamation of the various Companies supplying gas to Paris took place in 1856, he was appointed Carbonizing Engineer to the Paris Gas Company; and a year later he was promoted to the more responsible post of Engineer-in-Chief. This he held till 1894, when, after 52 years of work, he retired.

M. Arson was one of the founders of the French Society of Civil Engineers in 1848, served several times on the Committee, and was Vice-President in 1876 and the following year. It was only his modesty that kept him from occupying the highest position that his colleagues could offer him. He was nevertheless an industrious worker for the advancement of the Society; and its Transactions were enriched by several contributions from him. It was, however, his papers on "The Flow of Gas in Long Pipes," and on "The Construction of Gasholder Tanks and Gasholders," which brought him into prominence, and attracted the attention of gas engineers all over the world. For the former of these papers (translations of both of which, made by the late Dr. Pole, appeared in our columns), he was in 1867 awarded a premium by the Society. In fact, he obtained for this classic work the first of the annual prizes founded by that body; and he also received for it the Monthyon Prize awarded at a later date by the Academy of Sciences.

The deceased gentleman was not only an able engineer; he possessed the valuable gift of imparting his knowledge to others. During his long professional career, he had many pupils, who, whether in the service of the Paris Gas Company or in that of other Companies in the provinces or abroad, continued the traditions they had received from him. It was always a pleasure to him to see any of his old pupils or subordinates, whom he always regarded as personal friends. One could not but admire his indefatigable love of work, his devotion to duty, and his kindly consideration for the young and the lowly. Though he had retired from active service, he was retained by the Company as their Consulting Engineer, and took a keen interest in their affairs. Gradually, however, the weight of years began to make itself felt; and he passed away in the presence of the members of his family, who will ever hold him in affectionate remembrance, which will be shared by all who were associated with him when in business or enjoyed the pleasure of his friendship in his retirement.

* Wie eine moderne Teerdestillation mit Dachpappenfabrik eingerichtet sein muss, von Willy Peterson-Kinberg, Ingenieur-Chemiker und Betriebsleiter. Vienna and Leipsic, 1904.

We regret to record the death, early last Tuesday morning, in his 78th year, of Mr. W. PALGRAVE BROWN, J.P., the Chairman of the Gorleston and Southtown Gas Company. Deceased had been connected with the Company for upwards of 36 years—first as Secretary, and latterly as Chairman. He joined the Eastern Counties Gas Managers' Association at its inception, and took a keen interest in all gas matters. He was well known and highly respected throughout East Anglia; and he will be sadly missed by a large circle of friends.

Telegraphic information has been received by the San Paulo Gas Company, Limited, that their Engineer at San Paulo, Mr. F. SPARKES, was killed on Wednesday last by coming in contact with an electric wire, while carrying out his duties. No further particulars are yet to hand. He is the third member of the Company's staff who has lost his life in this manner during the last three years. Mr. Sparkes has held the appointment since the retirement of Mr. J. H. Wood in 1901; and by his death the Company have lost a useful and valuable servant.

The shareholders of the Welsbach Company will learn with profound sorrow of the death of their late Chairman, Mr. EDGAR WILLIAMSON, which took place at St. Cross Mill, Winchester, on Monday evening last week. To have been appointed to the head of the directorate on the deposition of the old Board when the fortunes of the Company were in the balance showed the honour and regard in which Mr. Williamson was held; to have taken the position in such tumultuous and anxious times showed an enviable courage on his part. Mr. Williamson justified, by his works and deeds, his selection for the post, which he did not seek nor wish to hold, excepting from the great sense of duty which dominated him in the matter. However, he steered the concern (with the hearty support of his colleagues, and with his own unfailing ability) to the place where those who had its best interests at heart desired to see it; and the shareholders are now about to reap the fruit of his work. That work was well done. He lived to see the end of it; but the felicitation of being able to propose to the shareholders the payment of a dividend was not, it will be generally regretted, to be his. In a personal letter from Mr. W. Resbury Few, the Secretary of the Company, it is mentioned that Mr. Williamson was compelled by the doctor's orders, some few months ago, to relinquish the Chairmanship of the Company owing to the failure of his health; but it was then hoped that, with rest and quiet, he would still live for some years.

Waverley Association of Gas Managers.—Intimation has been sent out by the Hon. Secretary (Mr. W. Young, of Penicuik) that the half-yearly meeting of the Waverley Association of Gas Managers is to be held in the Roxburghe Marine Hotel, Dunbar, on Thursday, April 7. The President (Mr. P. Blair, of Haddington) will deliver an address, after which there will be a discussion. Office-bearers for the year will be elected. The party will subsequently dine together.

The Informal Meeting of Scottish Gas Managers.—The Convener (Mr. A. Yuill, of Dundee) has sent out instructions that the twenty-first annual informal meeting of Scottish Gas Managers will be held in the Grand Hotel, Glasgow, on Wednesday, April 13. Mr. J. M'Gilchrist, of Dumbarton, will preside and deliver an address, which will be followed by a discussion upon questions affecting the industry. It is pointed out that the informal meeting has now attained its majority; and it is trusted that gas managers will endeavour to make the meeting a success by giving it their presence and support. The meeting will be followed by a dinner, to which lady friends may be invited. In the evening, Mr. and Mrs. M'Gilchrist are to give an "At Home" in the hotel.

Output of Coal in the Past Year.—The tables relating to the output of coal and other minerals and the number of persons employed at mines worked under the Coal and Metalliferous Mines Regulation Acts during the year 1903 have been printed. They have been prepared by direction of the Home Secretary from returns furnished by the Inspectors of Mines; and form part of the general report and statistics relating to mines and quarries. The output of coal from mines under the Coal Mines Regulation Act, which was 227,084,871 tons in 1902, was 230,323,391 tons in 1903; showing an increase of 3,238,520 tons. The number of persons employed at these mines in 1903 was 842,066—an increase of 17,275 compared with the preceding year.

A NEW DEPARTURE IN PURIFYING-GRIDS.

By F. D. Marshall.

For some time past, the attention of many of us has been directed towards improvements in purifiers—that is to say, with the purifiers themselves; but little attention has been paid to what is, however, of far greater importance—viz., the internal arrangements for carrying the purifying material, and the direction of the passage of the gas.

On the Continent, engineers have realized that the old-fashioned arrangements which have obtained for many years—by which the purifying material is supported on grids or grilles—are capable of great improvements; and many experiments have been made, from time to time in this direction. Perhaps the most interesting were those carried out by Herr Merz, the Engineer of the Cassel Gas-Works, and described last year in the "Journal für Gasbeleuchtung." He demonstrated how it was possible to use purifiers with a less ground-area than hitherto, but of considerably greater height. The trouble experienced in reducing the ground-area of the purifiers, and increasing the depth of material, has been the excessive resistance presented to the gas. This was the case in the experiments made by Herr Merz, who employed a depth of 700 mm. (27½ inches) per layer of material. To decrease this resistance, by preventing the purifying material from consolidating by reason of its own superincumbent weight, and to maintain it in a condition of comparative looseness, is the problem some of us have endeavoured to solve.

Herr Keller, the Engineer to the Mülhausen Gas-Works, essayed the experiment of inserting flat boards into the mass of the purifying material—see fig. 1. This had the effect of, to a great extent, preventing consolidation; and at the same time it broke up the passage of the gas, causing it to travel a considerably longer distance. Something better than this crude method was, however, wanted; but it was clearly demonstrated that it was possible to employ a single layer of material in purifiers of considerable depth.

The time during which a purifier can remain in use depends, in the first instance, on the quantity of purifying material it contains (see Merz's experiments). Much, however, depends upon the degree of moisture contained in the gas, and which is more or less deposited on the purifying medium. According to the experiments made by Herr Hollweck, the Engineer of the Munich Gas-

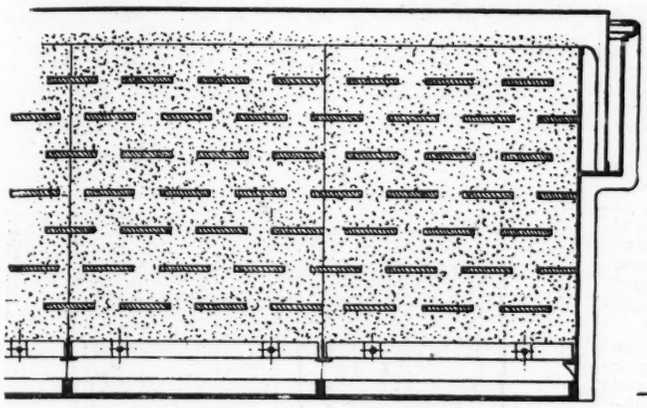


Fig. 1.

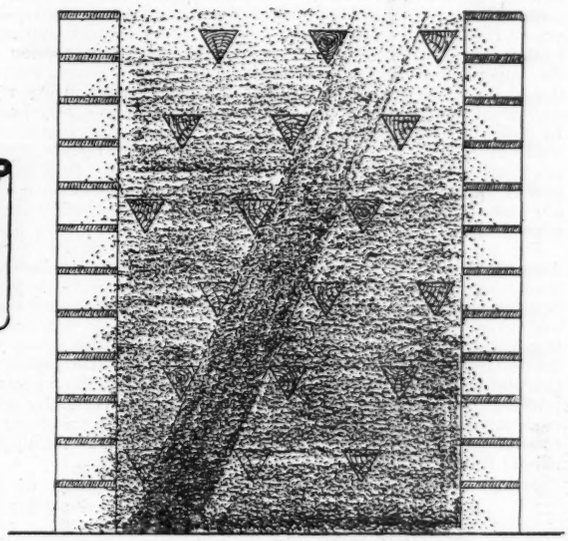


Fig. 3.

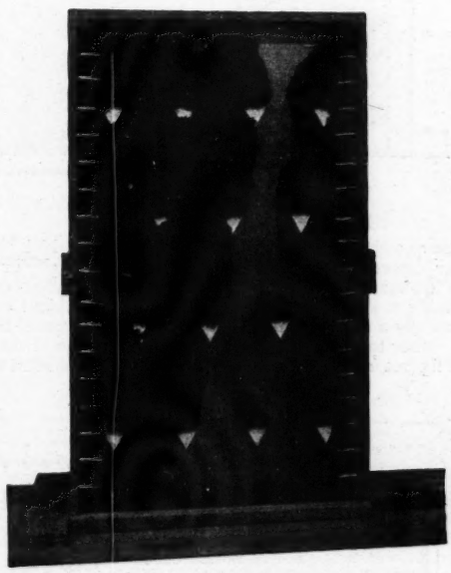


Fig. 2.

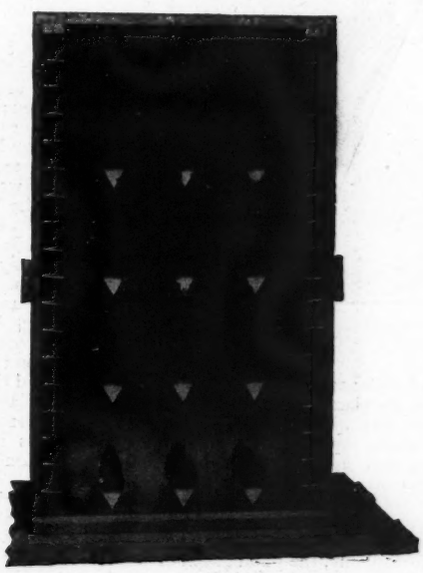


Fig. 4.

Works, it appears to be desirable to depart from the present practice of allowing the gas to enter at the bottom of the purifier and leave at the top, and to permit the gas to enter the purifier in the centre, so that the stream is divided—one portion passing downwards through the lower layers, the other portion passing up through the upper layers. These experiments were further verified by Herr Zobel, the Engineer of the Zwickau Gas-Works.

This arrangement offers the advantage that, with the same ground-area of purifier, almost double the purifying surface is presented to the gas. At the same time, the speed of travel is decreased by some 50 per cent., and naturally reducing the back-pressure. With this arrangement of divided current, it is evidently desirable that the upper and lower layers of material should be as deep as possible; and the problem immediately arises as to the possibility of making the layer sufficiently deep without preventing consolidation.

Following up the experiments previously mentioned, the writer and Herr Ingenieur Menzel, of Berlin, have made trials of various forms of boards and staves inserted in the material; but it was soon apparent that ordinary shaped boards or staves were unsuitable, as an empty space was formed underneath, which could possibly influence the passage of the gas.

A triangular sectioned stave was at last decided upon—somewhat similar to that used in the "Jäger" grid. The precise section

of stave employed in the "Jäger" form of grid, does not, however, permit the passage of the gas in a vertical direction, as, according to Herr Jäger's arrangement, the grids break-joint, as it were, with each other. A series of superimposed grids placed in a purifier on the Jäger plan, when viewed from above, present an almost impassable passage to the gas; and to obtain any advantage from the Jäger plan (and its advantages compared with the ordinary form of grid cannot be gainsaid) the gas must be made to travel sideways or in a horizontal direction.

To demonstrate this, two wooden boxes were employed representing a full-sized section of a purifier. These boxes were fitted with glass fronts, so that the behaviour of the purifying material with which the boxes were filled could be observed under certain conditions. The boxes were arranged with removable bottoms, so that they could be withdrawn from underneath the mass of the superincumbent oxide.

In one box the triangular sectioned bars or staves were arranged to represent the section of a series of "Jäger" grids as they would be arranged in a purifier on Herr Jäger's plan. On removing the bottom supporting boards, it was evident that the staves were, to some extent, supporting the mass, but not in a manner one would expect according to the claims set forth. The support opposed to the consolidation of the mass of oxide was in proportion to the upper surfaces of the triangular bars, and in proportion to the angle of repose of the oxide. The greater portion was not supported by the staves at all, but only by the angle of repose. In consequence, a pressure was exerted by the superincumbent oxide on the lower part, in proportion to the divergence of the angle of repose from the vertical line—see fig. 3. This is apparent by closely observing the formation of the oxide in fig. 2, after the support was removed. [The diagram is taken from a photograph.]

Fig. 4 shows a box fitted on the principle adopted in the "Standard" grid. It will be observed that the rows of triangular sectioned bars or staves do not break-joint, as in the previous case, but are vertically over each other. The distance between each bar in a horizontal direction was the result of a very large number of trials. The distance eventually decided upon was 10 centimetres. Furthermore, it was found by careful experiment that the flat-topped form of triangular bar adopted in the "Jäger" grid was not good when the bars were arranged vertically over each other as in fig. 4; and for a special reason it was decided to alter the section of the triangular bar, and to make the upper side in the form of a ridge or roof.

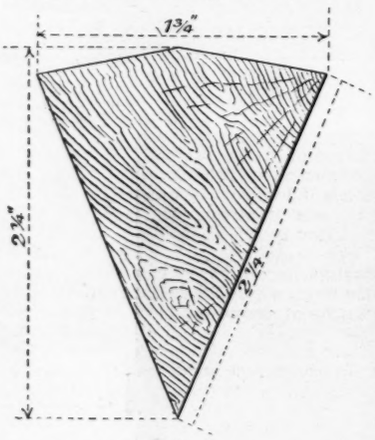


Fig. 5.

The result of arranging the grids as shown in fig. 4, and adopting the peculiar form of stave depicted in fig. 5, was most remarkable. In the first instance, it permitted the gas being passed through the purifiers in the usual vertical direction; but, what was more curious, it was found that, when the bottom supporting board was removed from the box (fig. 4), with the exception of the oxide resting immediately between the lower tier of staves and the supporting board, the bulk remained almost quiescent between the remaining staves. The bulk gave a little "set;" and this revealed through the glass front a series of beautifully formed arches springing from the sloping upper edges of the staves. Each row of arches, self-formed, supported the superincumbent mass immediately above; and, in consequence, hindered consolidation of the purifying material.

The experiments were made over and over again with the same results, and when the box was knocked and even shaken—except for a slight disturbance—the arches remained almost intact.

Unfortunately, the photograph of the box (fig. 4) is too dark to show these arches; but it indicates clearly that, with the supporting bottom removed, the oxide remains in the box. The arches formed are shown graphically in fig. 6.

These experiments prove the possibility of considerably increasing the depth of the purifying material employed in purifiers under the supposition that the carrying staves are properly adjusted; and it is claimed for the "Standard" grid that it permits the gas to flow in either a horizontal or vertical direction. But, what is beyond all the crucial point, it permits of purifiers being constructed with a greatly diminished ground-area, and a considerably increased depth of material. This is not quite the case with the "Jäger" grid, which only allows the gas to flow in a horizontal direction.

The idea of using a greater depth of material than hitherto on a small base is not new, and has often been touched upon in the "Journal" and in the American technical papers.

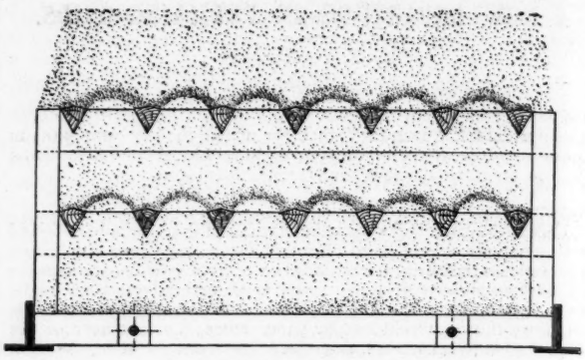


Fig. 6.

Only by an elaborate and costly arrangement of louvres can such an idea be approximately carried out, and even then considerable pressure will be exerted on the lower portion of the mass—see fig. 7.

The idea of utilizing the louvre system was practically carried out by Herr Merz, of Cassel, but was amplified and extended by Herr Jäger, who was compelled to adopt louvres, as his gas could only travel, as before indicated, in a horizontal direction.

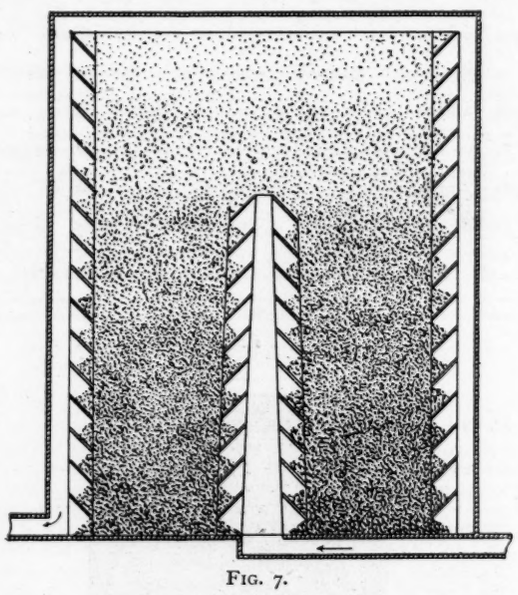


Fig. 7.

The question naturally presents itself as to which really is the better direction for the gas to travel—horizontally or vertically. This question is answered by determining what quantity of purifying material can, in purifiers of equal cubical capacity, be practically and economically stowed so as to present the greatest area either to the horizontal or vertical passage of the gas; and from figures at my disposal it appears not to be difficult to calculate this.

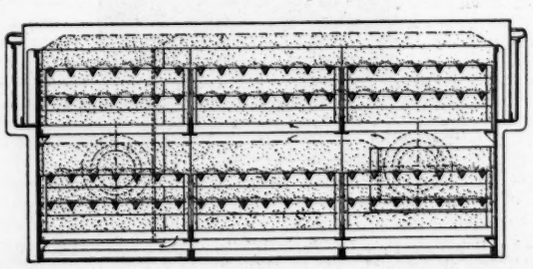


Fig. 8.

Taking the "Jäger" plan as the latest exponent of the horizontal line of travel of the gas, and assuming a purifier 6·345 m. × 5·8 m. × 1·644 m. fitted with ordinary grids, the surface presented to the gas will equal 36·8 square metres; and the actual quantity of material the purifier is capable of holding will equal 22·08 cubic metres (approximately). By replacing the ordinary by the "Jäger" grids, the effective purifying area will be increased to 67·2 square metres, and the cubic contents of the box to 34·90 cubic

metres—thus showing the vast superiority of the "Jäger" grid over the ordinary form. By adopting, however, the "Standard" form of grid and the divided gas stream, an even higher result is attained—viz., a purifying area of 73·6 square metres, and a capacity of 40·48 cubic metres. In other words, while the "Jäger" grid offers a purifying area of 83 per cent., and in cubic contents 34·9 per cent. greater than a purifier fitted with the ordinary grids, the "Standard" grid provides 100 per cent. greater purifying area, and 85·3 per cent. greater cubical contents. Thus, in a purifier of the above dimensions, the results are—

	Ordinary Grid.	"Jäger" Grid.
Effective Purifying Area	36·8 sq. metres	67·2 = 83 per cent. increase
Volume of Material . .	22·03 cub. metres	34·6 = 57 " " "

"Standard."

Effective Purifying Area . . .	73·6 = 100 per cent. increase
Volume of Material.	40·48 = 83·3 " " "

By dividing the gas stream as in the "Standard" plan, the resistance offered by the material to the gas is nearly 50 per cent. less. It is likewise evident that, as regards the question of filling and emptying purifiers, much labour is saved by employing the "Standard" pattern grid, as the oxide being shovelled *en masse* in deep layers into the purifiers, completely buries the grids; and, in emptying same, owing to the peculiar form of the grids, they free themselves of adhering purifying material by a simple shake—all raking between the bars, as in the case of ordinary purifying grids, being unnecessary.

It appears to the writer that the possibility of building purifiers 15 or 16 feet, or even 20 feet, high on a small base has been reached—always, however, remembering the mechanical difficulties in filling and emptying such towers. But what he particularly desires to emphasize is the possibility, by adopting the "Standard" grid, at a comparatively small outlay, and with a minimum of disturbance, to practically double the capacity of existing purifiers.

P.S.—On Friday there was, through the courtesy of Mr. W. S. Haddock, the Engineer, a small gathering of gas managers at Warrington, to witness some experiments made with the model purifier fitted with the "Standard" grids above described. The experiments fully confirmed the peculiar formation of arches in the purifying material referred to in the article. Experiments were made with lime as well as oxide; the results being the same. The assembled gentlemen appeared to be exceedingly interested in what they saw. The model will be in London next week, and available to any engineers who will call at the offices of Messrs. Kirkham, Hulett, and Chandler, at Palace Chambers, Westminster.

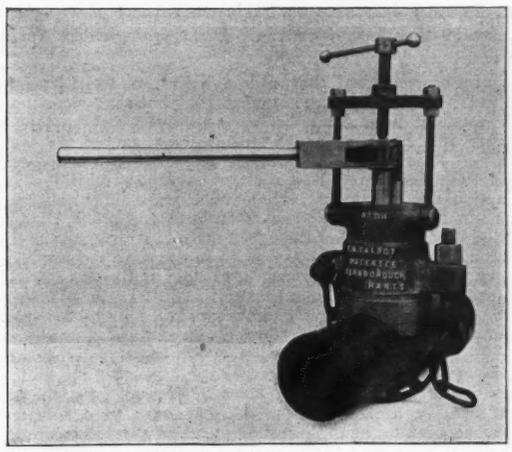
A NEW TAPPING MACHINE AND UNION.

In our "Register of Patents" on the 8th inst. (p. 629), there appeared a brief illustrated description of what promised to be a most effective arrangement for tapping gas and water mains and connecting branch-pipes therewith; and a personal inspection of the machine in operation at the works of the Frimley and Farnborough Water Company, at Farnborough, Hants—whose Manager the inventor (Mr. F. W. Talbot) is—has satisfied us that it will do what is claimed for it. The abstract of the specification, of course, explains the general idea and the method of working; but an examination of the arrangement and an ocular demonstration of its capabilities bring to light several points in favour of the appliance which are not made manifest by a mere perusal of the patent.

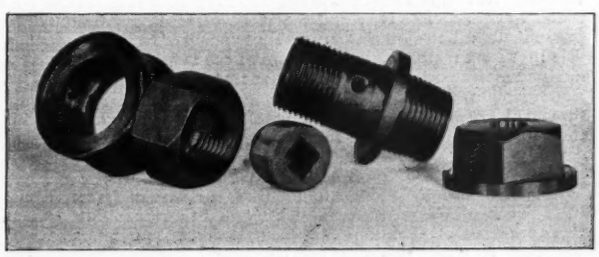
Perhaps the most important of these advantages is the extreme lightness of the apparatus. The smallest size (which will tap a main for anything up to a 1-inch branch or service) weighs only 10 lbs., and can thus be easily carried about by a workman on a bicycle—almost, so to speak, in his pocket. It is intended to manufacture two other sizes, for taking up to 2-inch and 3-inch pipes respectively; and though these will naturally be somewhat heavier, their comparatively light weight will still be a very great point in their favour. This question of weight is, of course, a specially important one in the case of the large number of companies who serve scattered districts. At Farnborough, for instance, the Company possess two pumping-stations 10 miles apart; and the men have found this compact little tapping machine a great advantage in getting to the various parts of their large area.

In design, the machine is very simple, as will be seen by the accompanying photograph. There are no slides or valves to get out of order; and there is no difficulty whatever in drilling mains at any point that may be desired. As to its efficiency, the complete operation of tapping a main, inserting the ferrule, and removing the machine can be accomplished in the short space of something like three minutes; and at the time of our visit, this was done against a head of 350 feet—practically without losing a drop of water.

The machine, as will have been gathered from the patent abstract previously published, consists of a cylinder with a revolving piston, through which pass two spindles, one of which carries the drill and tap and the other the ferrule or union. The hole in the main is drilled and tapped by means of a ratchet in the usual manner. When this is done, the tap is withdrawn from the hole, and the revolving piston is turned half round, so as to bring the second (or ferrule) spindle directly over the hole. The ratchet is then again applied, the ferrule screwed tightly home, the spindle withdrawn, and the machine removed from the main. The method of fixing the machine to the main is shown in the photograph. It may, however, be mentioned that the outside diameter of No. 1 size is not more than 4 inches, while the depth is about 5 inches.

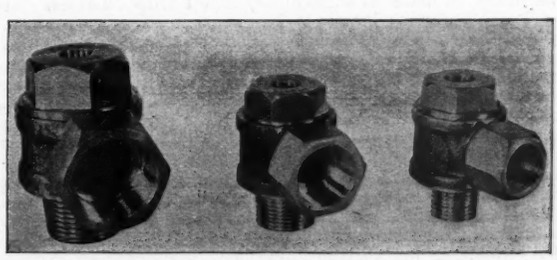


The ferrule already referred to, which constitutes an essentia part of the invention, is screw-threaded to fit the thread cut in the main, and above the thread is an annular external flange. Over this are the exit-orifices; and above these again is cut a thread to receive a screw-cap. The bore of the ferrule contains a plug which closes it during the process of fixing. After the stem has been screwed tightly home, and the machine removed, the body of the ferrule is dropped into position, the cap is screwed up tightly, the plug is raised by means of a key, and the gas or water is free to pass from the main to the branch or service. The principal feature of the ferrule is that, being formed as a swivel, it can be pointed in whatever direction is desired for the purpose of connecting with the branch-pipe. This, it seems, must be an advantage over a rigid ferrule, which, once placed in position, may perhaps have to be altered—that is to say, either screwed up tighter, with possible risk of cracking the main if it is a thin one, or slackened—in order to bring the outlet just where it is wanted. In order that the design of the ferrule may



be thoroughly understood, we give an illustration of the various parts, as well as one of three sizes—1 inch, ¾ inch, and ½ inch—in the completed state.

As has been mentioned in the "Journal," Mr. Talbot does not claim novelty for making a screw-threaded hole by means of a tool on one spindle, and afterwards inserting into the hole by



means of another spindle a ferrule-top, without moving the body of the apparatus in which the spindles are mounted. What he does claim is the precise method employed for this purpose with the swivelling ferrule.

The invention is one that may be commended to the consideration of gas and water engineers, to whom the inventor will be pleased to send machines for testing purposes.

LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.

Sulphur Purification.

The fare provided for the March Meeting of the London and Southern District Junior Gas Association, which was held at the Regent Street Polytechnic on Friday, consisted of a paper on "Sulphur Purification," by Mr. O. W. Dougan, of the Wandsworth and Putney Gas Company.

The author remarked that, although in 1860 the Legislature began to try and control the amount of sulphur sent out with coal gas, it was not until some twelve years later that any success was achieved. In 1872, Mr. R. H. Patterson, one of the Metropolitan Gas Referees, who had taken a great deal of interest in the question, discovered that certain sulphides of the alkalies were active absorbents of carbon bisulphide. This substance formed about four-fifths of the total "sulphur other than sulphuretted hydrogen;" and therefore if its partial removal could be economically effected, there was no reason why the Act should longer be set aside. On account of the greater ease with which liquid reagents could be manipulated, Mr. Patterson favoured the use of soda and ammonia solutions; but lengthy experience did not appear to justify the preference, as calcium sulphides were now almost universally employed. With only slight modifications, however, the system of purification evolved by him was the one at the present day in operation in works to which the sulphur clauses applied. Before proceeding to describe the mechanical working of the plant, the author gave an account of the chemical behaviour of the various deleterious constituents of crude gas, and the manner in which their inter-reactions might be taken advantage of to assist in their elimination, in order that the reasons determining the sequence of removal of the impurities might be properly appreciated.

This explanation, he said, made it clear that, in whatever position the vessels for the absorption of bisulphide of carbon were placed, the complete removal of carbonic acid must precede them. The "carbonates," as they were called, came first in the series of dry purifiers. If the grid area was sufficient, two boxes for each impurity would be ample provision. In the general method, the "oxides" for sulphuretted hydrogen followed the "carbonates;" and next in order came the "sulphides" for bisulphide of carbon. Two "checks" completed the arrangement. The "carbonates" were charged with CaH_2O_2, which at first took up carbonic acid and sulphuretted hydrogen simultaneously. As the calcium hydrate became used up, the superior chemical affinity of carbonic acid asserted itself, and sulphuretted hydrogen was evolved, which travelled forward to the "oxides," where it was absorbed by hydrated ferric oxide. The "sulphides," preferably filled with lime still warm from slaking, were prepared *in situ*. Not only carbonic acid, but oxygen, would render sulphide vessels ineffective; and therefore care should be taken to prevent the admission of air into foul mains. Its bad influence was no doubt owing to the oxidation of the sulphided lime, with a deposit of free sulphur. On this account, it was impossible to attempt complete revivification of the oxides *in situ*; but an alteration in the order of purification rendered even this possible. If the "oxides" were put into the third place in the series, the purification was just as effective, and the amount of oxygen or atmospheric air required could be admitted at the inlet with the gas. When the "oxides" were run third in the series, fewer vessels might be used, as only one "check" would be required.

The author summed up this portion of his paper by remarking that it was expedient for successful sulphur purification to ensure: (1) That the liquor be worked up to as great a strength as possible without permitting ammonia to escape. (2) That the sulphiding process be not carried out at too low a temperature. (3) That carbonic acid be not allowed, under any circumstances, to enter a sulphide box used solely as such. (4) That oxygen be prevented from entering a sulphide vessel at work. The reservation "at work" was put in advisedly, as air might be made to serve a very useful purpose in the case of a vessel becoming inert. If it were shut off and air blown through, its activity might often be restored. Whatever method of purification was adopted, it was most essential to know the quantity of the different impurities to be dealt with, as well as to carefully trace their advance in the different boxes devoted to their removal. This could only be ascertained by frequent periodical testings; and the best form of apparatus for rapid estimations of carbonic acid, sulphuretted hydrogen, and bisulphide of carbon was Harcourt's colour test. While on this subject, the author said a few remarks regarding possible sources of error in results obtained by the Harcourt test might not be out of place; and we reproduce this and the final portion of the paper in his own words.

In estimating for carbonic acid and bisulphide of carbon, always use an oxide purifier in front of the apparatus, except where the test is made on gas free from sulphuretted hydrogen. This precaution is omitted by some operators. The chemical action of BaH_2O_2 is analagous to that of CaH_2O_2; and in such a case, both the carbonate and sulphide are produced side by side. Therefore the density of the precipitated carbonate cannot be properly compared with the standard. It has been said this only occurs up to a certain point, when the sulphide is decomposed and its colour discharged. If the BaH_2O_2 solution were of just such a strength that no more carbonic acid could be absorbed than is represented by the standard, this would be nearly true. But a saturated solution is used. The term "saturated" is a relative one; the solubility of a substance depending chiefly on the temperature. This being so, the hydrate must be in excess of the amount required, to make sure of its efficiency under all climatic changes. Hence, if sulphuretted hydrogen enters the tube containing the reagent, it will be present as sulphide at the end of the test. In the case of bisulphide of carbon, the reason for the precaution is obvious. Bisulphide of carbon is estimated as sulphuretted hydrogen; and any additional sulphuretted hydrogen would only prejudice the result. Standards for sulphuretted hydrogen should be kept in a dark place when not required. If exposed continually to the light, the liquid becomes cloudy, deposits a sediment, and loses in depth of colouring. Tests made with such faulty standards would give results representing a larger quantity of sulphur than is actually contained in the gas.

When testing for sulphuretted hydrogen, if it be required to conduct the gas to a point remote from the purifier, always use tin-lined pipe. The rust in iron barrel absorbs sulphuretted hydrogen, with the result that the values obtained fall below the truth. Many works now concentrate the purifier tests at one point. This is an excellent labour-saving device, if the operator is careful to blow off the stale gas from the pipes. A connection to the exhaust is useful for this purpose.

The Harcourt test for bisulphide of carbon consists of passing the gas through heated platinized pumice, when the free hydrogen combines with the sulphur, and carbon is deposited. The action of the platinum is catalytic. It assimilates the hydrogen molecules, divides the bonds which hold the atoms together, and gives them off again in a nascent state, in which condition their chemical energy is more vigorous. Now it is quite obvious that the finely divided carbon would gradually clog the porosity of the mass, and hinder it performing its duty. It is thus necessary at intervals to empty out the platinized pumice and purify it by strongly igniting it in a crucible. The carbon is oxidized to carbonic acid.

In the directions for using the argand lamp, it is definitely stated that "the gas must be turned down until it burns with a non-luminous ring." Although a little latitude may be allowed when the operation takes place in a draughty position in the purifier-house, it is easy to err on the wrong side; and it will be found far better to enclose the lamp in a ventilated box, observing the instructions to the letter. Too much heat may give rise to many perplexing combinations, a few of which it may be interesting to trace. Assume, for example, that it is desired to estimate bisulphide of carbon on the "clean" main, and that excess of air has been admitted to the oxides for revivification purposes. The flame of the lamp is luminous, and a red glow shows on the bottom of the bulb. The normal action produces sulphuretted hydrogen. But the temperature reaches the combustion point of sulphur, and oxygen being present it combines to form sulphuric dioxide. These two gases react upon one another, thus: $2H_2S + SO_2 = 2H_2O + 3S$. These results may be easily observed. Beads of moisture condense upon the outlet of the bulb-tube, and a light yellow powder obscures the glass. Sulphur dioxide is also oxidized in the presence of heated platinum, and absorbing water forms sulphuric acid. None of these reactions is complete. A mixture of sulphite and sulphate of lead is precipitated; and not only the sulphur but the carbon may be oxidized. The basic lead acetate, on treatment with carbonic acid, produces a mixture of normal lead acetate, basic carbonate (white lead), and water. As basic lead carbonate is insoluble in water, the unhappy tester may get more precipitates than he knows what to do with. One might go on for a long time with possible reactions. Of course, to a chemist all this is obvious; but in many gas-works the person entrusted with the rougher testing is not well acquainted with chemical theory.

Several suggestions have been made from time to time for dealing with sulphur in the retort; but none of them, except Cooper's coal-liming process, is worthy of notice. This method, for which is claimed "an increase of ammoniacal liquor and a reduction of carbon bisulphide," is based on scientific principles. It consists of mixing a quantity of slaked lime with the charge before retorting. When bisulphide of carbon is passed over heated slaked lime, it is converted into carbonic acid and sulphuretted hydrogen; both substances being easily removable in the dry purifiers—thus: $2CaH_2O_2 + CS_2 = 2CaO + CO_2 + 2H_2S$. Unfortunately, the difficulties attending its practical application appear insurmountable. To ensure the thorough incorporation of the two materials, would entail an immense increase in labour and superintendence; and unless this is done, the process is valueless. Again, the residual coke contains a much higher percentage of ash than it would if carbonized in the ordinary way; its value thereby being correspondingly decreased. Carbon bisulphide is manufactured on a commercial scale by passing the vapour of sulphur over red-hot carbon; the resultant compound being condensed, and purified by distillation. If subjected to greater than red heat, dissociation takes place. This would lead to the assumption that, although the larger portion of contained sulphur is given off at the end of the charge, bisulphide of carbon must be formed at the initial stage, when the temperature of the retort has been lowered through the heat being absorbed in vaporizing the moisture in the coal. Evidently it is the most volatile sulphur which enters into the reaction. Horizontal retorts favour its passage to the ascension

pipe unchanged; and in no further treatment of the gas does it encounter conditions suitable to its decomposition or absorption, until it reaches the sulphide boxes. If, instead of travelling with the gas along the roof of the retort, it had been forced through the heated charge, it is doubtful if it would have escaped reduction by the nascent hydrogen set free by the destructive distillation of the coal. Now, in a water-gas generator, at the point where the steam enters, the conditions would be just as favourable for the production of bisulphide of carbon. Yet practically none is found. Why is this? It may readily be believed that the carbon and sulphur do combine; but as the product comes into contact with the decomposing water vapour, its reduction follows as a matter of course. But is it only a simple reduction?

The following method of obtaining methane will be familiar to all who have studied the elements of organic chemistry. When the vapour of bisulphide, together with steam, is passed over heated copper, methane is produced—thus: $CS_2 + 2H_2O + O\,Cu = CH_4 + 2\,Cu_2S + Cu\,O$. The copper merely acts as a reducing agent. It abstracts oxygen from the steam, leaving hydrogen free, which, in its nascent state, is sufficiently powerful to turn out sulphur from combination with carbon. The free sulphur combines with a further quantity of copper. Why should not a somewhat similar effect be brought about by substituting carbon for copper as the reducing agent? $CS_2 + 4C + 4H_2O = CH_4 + 2H_2S + 4CO$. A rough form of experiment to prove whether carbon bisulphide is broken up in this way might be performed by placing a piece of combustion tube, filled with finely powdered coke, in a chemical gas-furnace. One end is connected to a series of flasks containing water, carbon bisulphide, and materials for generating an inert gas. The flasks containing water and carbon bisulphide are mounted over bunsen burners. At the other end of the tube is placed a tarred oxide purifier, and a Harcourt's test for bisulphide of carbon with a Greville aspirator.

To start the experiment, sweep out all the apparatus with inert gas until oxygen has been entirely driven off. Light the gas in the furnace, and heat up the carbon till the approximate temperature of the generator is reached. Light the burners under the flasks, and so adjust them that only a small quantity of carbon bisulphide is sent over with a large amount of steam. The Harcourt's test in operation, continue the heat under the flasks until a fair amount of gas is collected in the aspirator. Then remove the burners, close the flasks, turn off the gas at the furnace, and allow all to cool down. The flasks are weighed before and after the experiment, and their loss noted. The decomposition of the bisulphide of carbon is estimated from the difference between the loss from the flask and the result of the Harcourt's test. The oxygen purifier may be reweighed, and will give directly the sulphuretted hydrogen formed. If it were worth while, the gas in the aspirator could be withdrawn, and analyzed for carbonic acid, oxygen, carbonic oxide, hydrogen, and light carburetted hydrogen. But the main feature would have already been proved; and if a more accurate determination were required, it would be attempted in a more scientific manner. Still, it may be asked, what does all this lead to?

In March of last year, Mr. Walter R. Jones, formerly of Rome, patented a combined coal and water gas plant, sketches and a description of which appeared in the "JOURNAL OF GAS LIGHTING."* It consists of a bed of inclined retorts, with two outside generators. The generators are arranged for forced draught and admission of steam, as in the ordinary water-gas type; but the producer gas formed in the "blow" is utilized for heating the settings. By a suitable arrangement of valves, either generator can be made to feed the bed while the other is making a "run" of water gas. There are two noticeable defects in this arrangement. Firstly, the blow and run must be of like duration; and, secondly, the heats under the coal-gas retorts are subject to variation. Mr. Jones also proposes, instead of passing water gas through the retorts, as suggested by Professor V. B. Lewes, to send the coal gas through the generator, whence it proceeds in company with the freshly formed water gas. He considers that by so doing the heavy hydrocarbons will be permanently gasified. It is open to question whether any gain in this direction would not be counterbalanced by the reduction of the illuminants.

The inventor does not appear to claim something else the process may be quite capable of—the reduction of sulphur compounds and an increased yield of ammonia. Of course, it is not to be expected that Mr. Jones's plant will be immediately adopted in many works with such an object in view; so a simple means of attaining the same end would be desirable. The Dinsmore process of carbonization was invented for gasifying the tarry oils from coal-gas manufacture. The gas from the retorts was led through a heated duct before being carried off from the settings. This duct was generally an empty retort. Now, if this chamber were filled with coke, and had evenly distributed jets of steam throughout its length, sufficient water gas would be produced for the complete reduction of all carbon bisulphide present. Only a mere skeleton of a process has been sketched here. No doubt, if it were thought practicable, many improvements could be devised by competent gas engineers in carrying out the details.

In the discussion which followed, the first speaker was Mr. W. B. Farquhar, who said, with reference to the question of sulphur at the end of the charge, that it was difficult to stop off the charge at the right time, especially with inclined retorts, in which they very frequently got an uneven layer of coal. He believed that with horizontals there was more chance of getting an even layer of coal; and then this matter could be better regulated. If the sulphur could be passed through the coke before going through the ascension-pipe, it could be reduced. Mr. T. D. Richmond referred to the arrangement of the boxes—two of lime, then two of oxide, next two of lime again sulphided, and finally two check boxes. He asked how it was possible to keep the boxes sulphided, as, of course, to do this it was necessary to pass sulphuretted hydrogen into them. The Hon. Secretary (Mr. P. F. Scarth) pointed out that the author said carbon bisulphide was formed in the early stages of carbonizing. He had himself, however, always understood that it was a high-heat product. He had expected to hear more about carbonic acid purification. Did it pay better to take this out or to leave it in the gas? Mr. W. Upton remarked that if they used oxide, of course, it had a saleable value to chemical people. This was a point to be considered in deciding between that material and lime. Mr. W. Vanner said that, with regard to Harcourt's colour test, the author stated it was necessary at intervals to empty out the platinized pumice and purify it by strongly igniting it in a crucible; and he asked whether it was not general, instead of taking out the platinum in this way, to draw air through the tube, and so revivify it.

The President (Mr. Walter Grafton) felt that, in these days of enlightenment and advancement in gas manufacture, he should have liked something to be said in the paper as to the necessity for all this trouble and expense in purifying. This had, however, not been touched upon. There were a great many towns in England that had their gas only purified by oxide, and did not use lime; and if this were good enough for them, it should be good enough for London, because, taking it on the whole, he did not see that a few grains more of sulphur was any disadvantage. Of course, they were allowed 22 grains in winter time; and as the total quantity in the gas was something like 40 grains, this was only 18 grains more. He did not therefore think this additional amount would make much difference. As to the use of carburetted water gas as a sort of means to an end in simplifying the process of purification, in that case he did not see the need for purifying the water gas except for sulphuretted hydrogen. Therefore it seemed to him quite unnecessary to pass carburetted water gas through lime purifiers. Touching again upon the question of purification, there was, as he had already mentioned, a very large percentage of gas being sent out unpurified by lime; and there was a distinct gain to the consumer by allowing these impurities to remain in. A better light was obtained with it, using incandescent burners, than from gas purified of all these things. The consumer got no better result—in fact, he obtained rather a worse one—from all this purification; and therefore it was going against his interests to purify the gas to such a degree. It was to be hoped that, with the advancement of the times, such action would be generally recognized as superfluous.

In the course of his reply to the various speakers, Mr. Dougan said that, with regard to the question about sulphur being produced in greater quantities in inclined retorts, it had struck him whether under this system, and also in the vertical retorts, the bisulphide of carbon would not be greatly reduced. He thought this was a matter that should be very carefully watched. Mr. Richmond had referred to the arrangement of the boxes. This was not his (the author's) arrangement, nor was it used in the works with which he was connected; but it was a plan that he had in several cases seen in operation. The lime was sulphided by bye-passing the oxide. Whenever a vessel was taken off as foul, it was emptied and freshly sulphided by bye-passing. Of course, there was the alternative method of having the sulphide in the second place; and this he strongly recommended, as it obviated the necessity for bye-passing. Mr. Scarth believed that carbon bisulphide was a product of very high heats. This was not his (Mr. Dougan's) impression; and he did not think it was the idea of chemists generally. The question of the use of lime or oxide, which was referred to by Mr. Upton, was, of course, one of economy. Oxide was always saleable for its sulphur; whereas the foul lime had to be got rid of. As to revivifying the platinized pumice, it had always been their custom—and he believed it was more effectual—to calcine the material. If air was drawn through the tube, there was a doubt as to whether the pumice was completely revivified. Personally, he never did believe in this purifying of gas. For instance, in taking tests for sulphur in a works not using any special means of purification, he had known for over six months the quantity not to exceed 22 grains. Then it might run up to 30 grains, but scarcely ever above that. Now, if this was so, all the expense of sulphur purification was undertaken for the purpose of removing a few grains only occasionally. Most of the time they would be within the limits of the Act; but, of course, it would be risky when working under the sulphur clauses to depend solely upon that.

Mr. R. H. Chree, referring to the tests made by the author in the works where no steps had been taken to get rid of the bisulphide of carbon, asked whether the scrubbers were utilized in any way to help to take out some of it, or whether it was due to the character of the coals that there was so little of it formed. Mr. Dougan replied that it was quite likely oxygen did enter into the reaction. Air was admitted at the exhauster for purification purposes. Of course, it was not only a question of oxide. Lime was used, but not with the object of eliminating the sulphur compounds, as the undertaking was not under the sulphur clauses.

* See "JOURNAL," Vol. LXXXIV., p. 822.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the Garston Gas-Works, Liverpool.

The members of this Association on Saturday visited the Garston Gas-Works, which form a special section of the Liverpool United Gaslight Company's undertaking, and are devoted exclusively to the manufacture of carburetted water gas. The party, numbering upwards of thirty, were received at the works by Mr. William King, the Chief Engineer, and Mr. Edward Allen, the Assistant Engineer, and dividing into three sections were shown over the whole of the plant—the special features of which were fully explained during the inspection.

Before starting on the tour round the works, Mr. King briefly explained their special purpose and general arrangement. He said the Company had been very pleased to afford every facility for the members visiting the works, which were probably unique so far as gas-making in Europe was concerned. They had there works which were specially and exclusively laid out for the manufacture of carburetted water gas. They were entirely arranged for this purpose; and they had never made any other than carburetted water gas at the works. In the first place, the carburetted water gas was supplied pure and simple; and as those present were no doubt aware, in Liverpool they supplied a gas of high illuminating power—not less than 20 candles. Owing to the greater specific gravity of the water gas, the ordinary burners used in Liverpool would not pass the requisite quantity of gas, and the people could not get the proper light. When they had a heavy gas, burners that would ordinarily pass 4 cubic feet would perhaps be passing only 3 feet; and consequently the light was small. Where the burners were changed to meet the requirements of the heavier gas, a good light was obtained; but many of the consumers would not consent to change their burners, and consequently—solely on account of the specific gravity of the gas—the Company determined to make some change. They therefore began to supply the gas half and half—that was 50 per cent. of coal gas and 50 per cent. of carburetted water gas. After this was done, there was a discontinuance of any complaints as to the light obtained from the gas, and there had been no complaints since. In fact, the people were extremely satisfied with the gas as now being supplied. Turning to the Garston works themselves, Mr. King said the Company had acquired 35 acres of land, and the works at present occupied about 10 acres; the other portion of the land being in reserve for further extensions, which had all been planned out. The existing works were only a part of a much larger scheme, which would probably be carried out in the future. The plant which had already been put down was sufficient to manufacture 3½ million cubic feet of carburetted water gas per day; and this production would, as he had said, be increased as the business of the Company extended. In spite of electricity, the business of the Company was increasing faster than for many years past; and the annual production of gas was now some 4000 million cubic feet. The Garston works, as they would see in going through, were laid out with the view of minimizing manual labour to the greatest possible extent; and one great advantage of a works of this description—where they manufacture carburetted water gas only—was that they knew exactly what was being done with regard to every detail connected with the process of manufacture. They knew to a nicety the quantity of oil, the amount of lime, and the quantity of coke that were being used, and the results obtained; consequently, they knew precisely where they were, and what they were doing. About seven miles distant, the Company had another of their works, where they manufactured coal gas; and this gas was brought through a distinct main to the Garston works to mix with the carburetted water gas. At Garston they had two separate meter-houses, through one of which the coal gas was drawn by means of an exhauster, and the other received the carburetted water gas. A breeches-pipe combined the two gases, which were then conveyed to the holder. In order to determine whether they had a good mixture of the two gases, it was analyzed at every possible point—both in the works and at a long distance away. They found that they had a perfect mixture; that the gas carried very well, and did not lose its illuminating power after it had travelled many miles. In order to get a uniform flow of the carburetted water gas, it was in the first place passed into a relief or regulating holder.

Mr. King then (by means of sectional drawings) described the process by which they manufactured the carburetted water gas, which is by the Humphreys and Glasgow plant. The process of manufacture was, he said, carried out in alternate turns of seven minutes for making gas and then four minutes for blowing up the generator, and so on. A great deal of nonsense, Mr. King proceeded, had been talked about this carburetted water gas. He did not, however, hesitate to say that it was the greatest step in advance that had been made in gas-making during the last half-century; and as in Liverpool they had been supplying this mixture of 50 per cent. of carburetted water gas with 50 per cent. of coal gas for the last seven years, he thought this was ample evidence that there was no practical danger in the use of the gas. He might say that where they had a proportion such as the above, there was not the slightest trouble. The introduction of carburetted water gas had enabled them to deal more successfully with the costly holder question; it also met the coal question very much, and brought the cannel people to reason. And it provided an outlet for coke, and helped besides to meet the labour question. Since the introduction of carburetted water gas, the financial position of the Liverpool Company had been greatly strengthened; and but for it they could not be supplying gas at the present time of the high candle power at the price they were doing. Then there was the great advantage that, with a carburetted water-gas plant, they were enabled to meet sudden emergencies; and Mr. King referred to several occasions when, within the course of a few hours, their production of carburetted water gas had without any trouble been doubled.

The several parties were then shown through the works; the members under the guidance of Mr. King being first taken to the railway-sidings where the coke and oil supplies are delivered direct on to the works. The coke is, by a hydraulic lift, raised to the top of the generator house, and descends by gravity into the charging hoppers. The oil is also, to a large extent, fed into the oil-storage tanks by gravity; and a special feature of the tanks is that they are built in a pit surrounded by a wall, so that in case of accident the whole of the oil would be retained in the pit and could not escape to other portions of the works. Passing on to the generator house, this contains four sets of the Humphreys and Glasgow generator which, Mr. King said, worked exceedingly well, and cost very little in the way of repairs. The four sets were together capable of producing upwards of 3½ million cubic feet of gas per day; and the storage holder had a capacity of 4 million cubic feet. During the inspection, Mr. King remarked that, in making water gas, it was of the utmost importance to have plenty of settling tanks, so that the tar might be allowed ample time to settle. Many people, he added, experienced great trouble with their tar simply because they had not sufficient settling tanks. In passing through the purifying-house, Mr. King remarked that he had dispensed altogether with slide-valves; the inlet pipes being simply bent into U form filled with water, and good tight valves put in. These give no trouble whatever. Incidentally referring to the outlet that a carburetted water-gas works afforded for coke, Mr. King mentioned that previously they had been glad to take 6s. 8d. per ton for their coke; now, with the diminished quantity they had to put on the market, they were getting 11s. 8d. to 13s. 4d. per ton at the yards.

Other sections of the works having been inspected, the respective parties returned to the offices, where tea was served.

Mr. Hill, the President of the Association, in proposing a vote of thanks to Mr. King for his kindness in permitting the members to visit the Garston works, and for the facilities which had been afforded for an inspection of the plant, said the works were of a modern type, and the opportunity of going through them had been highly appreciated. He was sure they had all learned something; and they had been able to pick up information that would be very useful to any of them who might be interested in the manufacture of water gas.

Mr. Ginman seconded the vote. The visit to the Garston works had, he said, proved one of exceptional interest, and had been the most useful to the members, as regards valuable information they had been able to gather, of perhaps any previous visit they had made to gas-works. Mr. King had most willingly given them every explanation they might require as to the various portions of the plant; and they were exceedingly indebted to him for his great courtesy and the generous manner in which they had been received.

Mr. Hill said, before the vote of thanks was put, he wished to include with it the names of Mr. Allen and Mr. Carter, who had also so much contributed to the pleasure and the instruction they had received that afternoon.

Mr. King, in responding, said it had been a great pleasure to receive the members of the Association, and to show them what were really unique works of their kind in this country. If they had seen anything to induce them to take up what, in his opinion, was one of the greatest improvements that had been introduced in gas-making, he should feel more than repaid. They could not carry on the works except for the valuable assistance they rereived from Mr. Allen and Mr. Carter. So far as he (Mr. King) was concerned, he was afraid that this would be the last occasion on which he would have the pleasure of meeting the members of the Association at the works, as in June next his official connection with the Company—after 48 years of service—would terminate. If, however, at some future time they should wish to visit the works, he was sure that Mr. Allen (who had been selected as Engineer-in-Chief, to fill his place) would be only too happy to receive them.

Institution of Mechanical Engineers.—In the recently issued annual report, it is stated that the total number in all classes on the roll of the Institution at the end of 1903 was 4211, as compared with 3892 at the end of the previous year; showing a net gain of 319. During the year, 491 candidates were elected, of whom 47 were formerly graduates, 1 member was reinstated, and 3 elections became void, thus making 442 names added to the register. The total deductions have been 123, made up of 46 deceases, 45 resignations, and 32 removals. Among other matters, it is mentioned that Professor Burstall reports that the 100-brake horse power gas-engine which has been designed for experimental work in connection with the Gas-Engine Research Committee is now ready for testing.

YORKSHIRE JUNIOR GAS ASSOCIATION.

The Monthly Meeting of this Association was held on Saturday, at the Town Hall, Dewsbury—the PRESIDENT (Mr. W. Cranfield, F.C.S.) in the chair.

The proceedings having been formally opened,

Mr. P. PARRISH (Dewsbury) read the following paper:—

PURIFYING MATERIAL AND SPENT OXIDE.

The gas obtained from the distillation of coal immediately upon leaving the retorts is associated with the following impurities: Certain hydrocarbons, carbonic acid, sulphuretted hydrogen, ammonia, cyanogen compounds, and sulphur compounds other than sulphuretted hydrogen. The tarry matters and ammonia, together with small quantities of sulphuretted hydrogen and carbonic acid, are removed in the hydraulic main, condensers, washers, and scrubbers; but the gas, on leaving the latter appliances, still contains quantities of sulphuretted hydrogen, carbonic acid, and other sulphur compounds. If the clauses in respect to the removal of the sulphur compounds are stringent, and assuming that such clauses are enforced, it is absolutely necessary that the sulphuretted hydrogen and other sulphur compounds should be eliminated. In the event, however, of the gas-works not being under these restrictions, then the removal of the sulphuretted hydrogen and other impurities is a matter about which the manager has to use his own discretion; and in such cases it is expedient that he should deliberate over the following points:—

1.—The combustion of gas with which is associated sulphur compounds contributes to the production of a vitiated atmosphere.
2.—The presence of carbonic acid in coal gas affects the illuminating power of such gas.
3.—In the event of the sulphur compounds having to be removed, carbonic acid must, of necessity, also be removed.

Many are the conclusions arrived at as the outcome of the consideration of the above matters. Some managers decide to remove only the sulphuretted hydrogen; others prefer to remove the carbonic acid, together with the sulphuretted hydrogen; and some go so far, even when under no restrictions, as to effectually remove all the impurities. Methods of purification, similarly to everything else in connection with gas manufacture, have been altered from time to time in the hope that greater efficiency would be secured. A review of such modifications would, no doubt, furnish a subject of no small interest to such an Association as this; while at the same time it would afford a tolerably good indication as to whether existing methods are all that can be desired, or whether the methods now employed should undergo further change in order to attain greater efficiency.

Quite recently, a process has been adopted for divesting the gas of carbonic acid and sulphuretted hydrogen by passing the same through a solution of ammonia, or partly purified liquor, contained in closed vessels. This method is in vogue at a few works; but apparently it has not gained such favour among gas managers as was at first anticipated.

The introduction of bog ore and oxides of iron into this country for purification purposes is ascribed to the fact that formerly the sulphuretted hydrogen and other sulphur compounds were removed by passing the gas through purifiers containing a material prepared by mixing iron vitriol (copperas solution) and slaked lime with sawdust, and allowing the moistened mass to be exposed to the air prior to being used in the purifiers. This material was known as "Laming Mixture." When spent, it was again exposed to the air, stirred up well, and again moistened with slaked lime and employed for purifying the gas once more. Managers of gas-works using the material at the time were of opinion that an interaction took place between the sulphuretted hydrogen and the ferric oxide, resulting in the formation of sesquisulphide of iron and water.

$$Fe_2O_3.3H_2O + 3H_2S = Fe_2S_3 + 6H_2O.$$

On being exposed to the air, it was supposed that the sesquisulphide was oxidized to iron vitriol with the separation of sulphur.

$$Fe_2S_3 + 8O = 2FeSO_4 + S.$$

The addition of lime, it was assumed, effected the conversion of the iron vitriol into hydrated ferrous oxide, which took up oxygen from the air, forming hydrated ferric oxide.

Subsequent investigations, however, revealed the fact that the only compound taking part in the chemical reaction was the oxide of iron, which abstracts sufficient sulphur from the gas to form sesquisulphide. This compound, on being exposed to the air, is oxidized—ferric oxide being again formed; and the whole of the sulphur separates out in the free state. The following equations explain the reactions:

$$Fe_2O_3.H_2O + 3H_2S = Fe_2S_3 + 4H_2O.$$
$$Fe_2O_3.H_2O + 3H_2S = 2FeS + S + 4H_2O.$$

After revivification

$$Fe_2S_3 + 3O = Fe_2O_3 + 3\,S$$
$$2FeS + 3O = Fe_2O_3 + 2\,S$$

As an outcome of the investigation just referred to, the employment of lime was dispensed with; and the essential constituent of the principal purifying materials now employed is hydrated ferric oxide.

In order to facilitate the consideration of the various oxides now used for coal-gas purification, I propose to divide them under two heads—artificial and natural.

ARTIFICIAL OXIDES.

There are several artificial oxides of iron now employed for the purification of coal gas; and the preparation of some of these is dissimilar to others. Unfortunately, it is impossible to secure information in respect to all these artificial oxides, inasmuch as the methods of preparation are more or less trade secrets. However, I hope to mention a few particulars with regard to the most important. In the production of aniline ($C_6H_5NH_2$), nitrobenzene and hydrochloric acid, together with iron filings, are used; the object being to replace the oxygen of the nitrobenzene by an equal number of atoms of hydrogen. There remains, after the production of the aniline, a residue which, until quite recently, was not utilized in any way. Investigation was made a few years ago with a view to ascertaining if it was possible to devise some means whereby this residue could be utilized; and the result of the investigation elicited the fact that it could be made available for the purification of gas. The aniline waste, which is in a semi-fluid state, is usually run into a receptacle (invariably sunk in the ground), and allowed to remain there until it assumes the consistency of ordinary mortar. It is then dug out and exposed to the air, after which it is placed in a disintegrator and ground to powder. It is subsequently mixed with sawdust and logwood chips, and is then ready for use. This material effectively removes the sulphuretted hydrogen, and is capable of accumulating about 50 to 55 per cent. of sulphur. The reason why it is not more generally used appears to be due to the fact that it frequently takes fire.

After the sulphur has been extracted from spent oxide by combustion in oxide kilns, there remains a residue which contains a considerable percentage of iron. Being regarded by chemists as a material of some value, and in view of the fact that they were of opinion that the iron could be readily extracted from it by adopting some smelting process, many investigations have been made with a view to discovering some means by which the iron could be extracted. Unfortunately, all efforts in this direction have proved abortive. The difficulty which confronted these investigators—and which, so far, has proved insuperable—arises from the fact that the spent oxide residue contains a fairly large percentage of fixed sulphur (averaging about 8 per cent.), the presence of which dispels the practicability of a process such as was surmised would be successful. Further inquiry has since been made, but this time on different lines; and happily this led to the discovery of two methods (the details of which have not been disclosed) which are capable of effecting the utilization of this burnt dust.

The following analyses show the percentage of moisture and sulphur at each fouling, after complete revivification, in the case of one of these, which is notable for not giving any back-pressure.

Fouling.	Sulphur.	Water.
1	8·95 per cent.	27·80 per cent.
2	16 84 ,,	28·62 ,,
3	26·29 ,,	23·24 ,,
4	41·26 ,,	18·24 ,,
5	46·33 ,,	14·24 ,,
6	51·66 ,,	5·79 ,,

Subjoined are analyses showing the principal constituents of a few oxides of iron (artificially prepared); the preparation and makers' names being omitted for reasons already mentioned.

	1.	2.	3.
Hydrated ferric oxide	58 per cent.	78 per cent.	30 per cent.
,, ferrous ,,	14 ,,	12 ,,	7 ,,
Organic matter	10 ,,	2 ,,	11 ,,
Moisture	14 ,,	4 ,,	42 ,,
Calcium sulphate	— ,,	— ,,	9 ,,

NATURAL OXIDES.

Natural materials containing ferric oxide in the hydrated form were found in peat bogs at a time prior to the discovery of the utility of this material for coal-gas purification. At that time, it was thought that the extraction of the iron from this material would be a process worth undertaking; but as soon as it was made known that materials, essentially constituted of hydrated ferric oxide, were eminently adapted for the elimination of the sulphuretted hydrogen in coal gas, previous ideas were abandoned, inasmuch as it was realized that if anything approaching a reasonable price could be obtained for this product as a purifying agent, it would be far better, and, probably, more profitable, to dispose of the same in its natural form. Bog ore was accordingly introduced, as being a suitable purifying material. At the present time, we have two kinds of bog ore, each of which claims to possess special advantages. The composition of these varies somewhat, as shown by the following analyses:—

	1.	2.	3.
Hydrated ferric oxide	21 per cent.	35 per cent.	30 per cent.
,, ferrous ,,	— ,,	2 ,,	1 ,,
Silica	3 ,,	1 ,,	4 ,,
Organic matter	9 ,,	14 ,,	12 ,,
Moisture	52 ,,	47 ,,	51 ,,
Aluminium hydrate	13 ,,	— ,,	— ,,

N.B.—Small quantities of phosphate of iron were found in Nos. 2 and 3.

It is necessary to divest these materials of a certain percentage of their moisture, inasmuch as when they contain 50 per cent. of water, they are not as susceptible to the removal of the impurities associated with the gas as when they contain 20 to 25 per cent. Precaution, however, should be exercised when reducing the amount of moisture, owing to the fact that if the bog ore becomes too dry, it is likely to occasion trouble and inconvenience, seeing that it will pass through the grids and cause back-pressure.

Weldon Mud.—This is a product recovered from the manganese waste after the pyrolusite has been used for the preparation of chlorine from hydrochloric acid. It is not, however, used alone for the removal of the sulphuretted hydrogen; but, possessing as it does a remarkable affinity for the latter gas, it can be used with advantage for divesting the coal gas of the last traces of this impurity. Subjoined is an analysis of the material.

Hydrated oxide of iron	1 per cent.
,, manganese peroxide	45 ,,
Moisture	46 ,,
Calcium carbonate	6 ,,

Like the various oxides of iron, Weldon mud can be revivified; and it accumulates about 50 per cent. of sulphur, which can be utilized for the production of sulphur dioxide. If this material could be obtained at a cheaper price, it would, no doubt, be employed in considerably larger quantities for purification purposes; but so long as a high price obtains, so long will its use be limited.

Suitability of an Oxide for Purification Purposes.

In order to ascertain the suitability of an oxide for purification purposes, it is necessary to make a number of analyses. The results of such analyses will furnish a remarkably good indication as to the value of an oxide. In the first place, it is necessary to determine the amount of moisture present; and in order to do this, a representative sample of the bulk of the material under examination must be secured. Great care should be exercised in obtaining such a sample, otherwise the results derived will be unreliable. Assuming that a representative sample of the oxide of iron had been secured, 10 grammes should be placed in a porcelain basin (previously weighed) and dried in a water oven at a temperature of 100° C. until the weight is constant. The loss in weight represents the amount of moisture present. If this dried sample be now subjected to a higher temperature, it is possible to estimate the percentage of water of hydration; and as has been clearly demonstrated by practical experiment, the intrinsic value of an oxide is dependent to a larger extent upon the hydrated state in which it exists rather than upon the percentage of ferric oxide present. Hence this salient factor should be carefully taken into account when ascertaining the value of an oxide. The quantity of organic matter should also be determined, inasmuch as this will furnish some conception as to the amount of the back-pressure likely to be exerted by the material. The organic matter can be ascertained by igniting in a crucible at a fair heat the residue remaining after the amount of moisture and water of hydration have been estimated. The loss in weight represents the amount of organic matter present.

In order to estimate the percentage of iron, the residue in the crucible remaining after the above estimation should now be transferred into a beaker, and digested with hydrochloric acid. A small quantity of nitric acid should afterwards be added. When the red colour has disappeared from the undissolved residue (thus indicating that all the iron has been dissolved), it is necessary to dilute the solution in the beaker with distilled water, and afterwards filter to get rid of the sand and silica, &c. The filter should be washed well, so that all the acid is removed. After the filtrate has been heated, a slight excess of ammonia should be added, which will precipitate ferric oxide and alumina (if present). A separation can easily be made between the alumina and the ferric oxide by filtering the mixed precipitates and subsequently dissolving with tolerably strong hydrochloric acid; and to make sure that every vestige of the iron solution has been removed from the filter, it is necessary to wash with distilled water a good number of times. This solution should now be brought to boiling point, and an excess of pure caustic potash added. The ferric oxide is thus precipitated, and must afterwards be washed, dried, ignited, and weighed as Fe_2O_3.

Spent Oxide.

When the spent oxide has accumulated about 50 to 60 per cent. of sulphur, owing to the fact that it is now almost effete and that the free sulphur interferes with the action of the oxide, it is advisable to dispose of same and secure new material. In gas-works parlance, the effete material is known as "spent oxide;" and this product is invariably sold to the chemical manufacturer, who uses it for the production of sulphur dioxide—this latter gas being subsequently converted into sulphuric acid. The commercial value of spent oxide is dependent to a large extent upon the nature and quantity of the constituents present; hence it is necessary that an analysis of this material should be made, in order to arrive at some conception as to its worth.

As a considerable portion of the spent oxide of iron produced in this country is sold on the basis of so much per unit per ton, the necessity for securing a representative sample of the bulk is apparent. Occasionally, difficulties arise owing to a disparity in test between the sample of the bulk drawn at the gas-works prior to delivery and the sample of the bulk taken at the purchasers' works. The greater portion of these difficulties would be obviated if rather more care was exercised and obvious scientific principles observed in the drawing of the sample. Under no circumstances should a sample be taken from the outside of a heap, as in that case, owing to atmospheric exposure of the spent oxide, the correctness of the sample would be invalidated. Again, assuming that a representative sample has been secured, it is essential that it should not be unduly exposed, seeing that the rapidity with which the evaporation of the moisture in the sample takes place is surprising.

The method I adopt for obtaining a representative sample is to take a small quantity of the oxide from several parts of the interior of the heap, thoroughly pound same as quickly as possible, and, if the analysis is not to be made at once, put the sample in a hermetically sealed tin.

Presuming most of those present, if not all, are familiar with the analysis of spent oxide so far as moisture and sulphur are concerned, I do not intend to bore you with superfluous details, but will proceed to consider other matters. As the presence of certain chemical compounds in the spent oxide affects the economical working of this material, it is indispensable that the chemical manufacturer should make a further analysis in order to ascertain the quantity present. One of the principal analyses that is made is the determination of the amount of ammonia and ammonium compounds present in the spent oxide. Of course, as can be readily inferred, the percentage varies considerably.

Fig. 1 shows one of the simpler forms of apparatus for estimating the percentage of NH_3 in spent oxide. Ten grammes of the spent oxide are placed in the flask B, which is connected to two other flasks A and C. In the flask A, a quantity of water is placed, and in C a quantity of $H_2SO_4 \frac{N}{1}$. The water in flask A is boiled, and prior to the steam reaching the flask B, a quantity of caustic

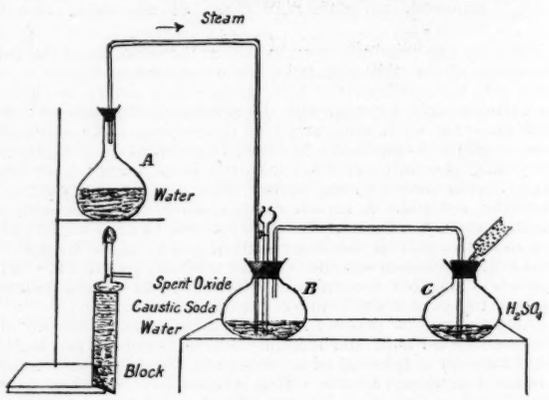


Fig. 1.

soda is admitted into the latter flask by means of the thistle-headed funnel, which is provided with a tap. The caustic soda liberates any fixed ammonia that may be present, and the steam expels the whole of the ammonia, which passes forward into flask C, and is absorbed by the sulphuric acid.

Particulars of a Determination.—Ten grammes of the spent oxide are taken. 15 c.c. of sulphuric acid normal placed in flask C. 13·8 c.c. of NaOH normal required to neutralize the sulphuric acid after the distillation of the ammonia in the spent oxide. Hence 1·2 c.c. is neutralized by the ammonia in the spent oxide; and as each c.c. is equivalent to 0·017 gramme of NH_3, the ammount of ammonia in the 10 grammes is $1{\cdot}2 \times 0{\cdot}017 = 0{\cdot}0204$. Hence the percentage is 0·204. The following calculation will, doubtless, convey to you a clearer conception of this matter: In 100 lbs. of spent oxide, 0·204 lb. of ammonia is present. Hence in 1 ton of spent oxide there will be

$$\frac{2240 \times 0{\cdot}204}{100} = 4{\cdot}56 \text{ lbs.}$$

of ammonia per ton of spent oxide. Converting this into pounds of sulphate of ammonia per ton of spent oxide, it will show

Ammonium sulphate

$$34 : 4{\cdot}56 : : 132 : x = 17{\cdot}7 \text{ lbs.}$$

Tarry Matters.—A close examination of the precipitated sulphur extracted (of course, by means of carbon bisulphide) reveals the fact that it is occasionally associated with tarry matters. It is, therefore, necessary to effect a separation of the sulphur and the tarry matter. This is usually accomplished by digesting the precipitated sulphur for several hours in pure alcohol. When the tarry matters are completely dissolved, they are decanted off, the sulphur well washed, and subsequently dried and weighed. The loss in weight represents the amount of tarry matter present. The two analyses just referred to indicate: (1) That the abstraction of the ammonia and ammonium compounds from the gas is ineffectual; and (2) that the operation of condensation is imperfect. Thus revenue is being lost owing to the non-recovery of these valuable products.

The Burning of Spent Oxide.

Fig. 2 shows a section of the arrangement in which the spent oxide is burned for the production of sulphur dioxide. The receptacles in which the combustion of the oxide is effected are usually 11 to 12 feet long by 18 inches to 21 inches wide and 9 inches to 12 inches high, having both ends open. They are built of fire-clay rebated tiles. These receptacles are arranged in three tiers, as shown in the drawing. When commencing a new set of kilns (this is the technical name given to the arrangement), or restarting a set, a fire is lighted on each bed, and kept going for three or four days until the kilns attain a temperature sufficient to effect the ignition of the oxide when thrown on the beds. Two of these beds are charged every hour with about 2½ cwt. of spent oxide for each bed. The oxide is uniformly distributed half way down the beds, and is allowed to remain there for eighteen hours, after which it is pushed to the back end of the bed, and another

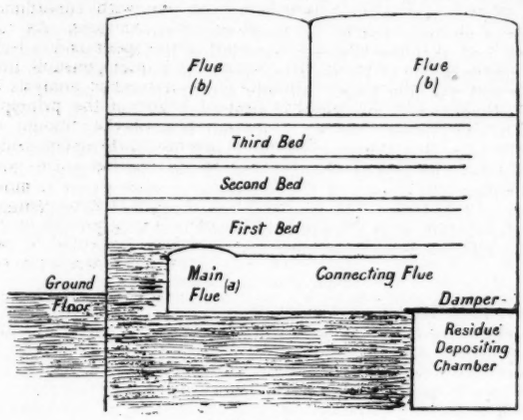


Fig. 2.

charge of 2½ cwt. is thrown on the fore part. This method of procedure is carried out on each bed. Every day the dampers are drawn, and the residue is deposited into the burnt-dust chamber. This residue is afterwards raked out of the depositing chamber, slaked, and tipped on to the burnt-dust heap. Meanwhile, provided the spent oxide is being burned properly—this can be regulated by carefully adjusting the slides on the doors so that the admission of air is sufficient to burn the sulphur to sulphur dioxide—sulphur dioxide is evolved, and is drawn from the bed into the connecting flue and thence to the main flue, which extends the whole length of the kilns. The sulphur dioxide travels along the main flue, and eventually issues from it into a flue at the far end of the kilns, and subsequently into flue (*b*) and away to the potting oven, where the sulphur dioxide comes in contact with the oxides of nitrogen produced by the action of sulphuric acid on sodium nitrate.

Whenever spent oxide is being burned which contains an appreciable percentage of ammonium compounds, a much larger quantity of nitrate of soda is required than is the case when the spent oxide is free from such compounds. Doubtless the ammonium compounds are volatilized by the heat from the kilns; and on coming in contact with the nitric acid—which is employed as a catalytic agent—some reaction must take place. As to the precise nature of this reaction, I am unable to say with precision; but I am of opinion that the following equation conveys some idea as to what takes place: $5NH_3 + 3HNO_3 = 9H_2O + 8N$. If the above reaction actually occurs—and a good deal of information is available which indicates that such is the case—then it is obvious that spent oxide containing ammonium compounds will not be as valuable, from the chemical manufacturer's point of view, as will the spent oxide that is free from it.

In conclusion, let me say that if I had had rather more time at my disposal for the preparation of this paper I should, no doubt, have been in a position to mention other matters of interest; but, unfortunately, under the circumstances, these must be kept for some future occasion.

Discussion.

Mr. W. N. Booth (Halifax) asked in what form the author found the ammonia in the spent oxide—whether he searched for pyridine in it, and what precautions he took to avoid including this in his calculation of ammonia, seeing that the method described would certainly transfer any pyridine into the standard acid. He doubted the accuracy of the scheme given for the gravimetric analysis of new oxide, especially as any temperature much above 150° C. for driving off the water of hydration would tend to decompose the organic matter present; while precipitating the iron as ferric oxide by caustic potash would result in a too high answer—it being almost impossible to wash away all traces of the alkali carried down by the iron. He strongly questioned the suggested explanation, at the close of the paper, dealing with the interaction of ammonia and the nitric acid in vitriol making. He asked Mr. Parrish if he had personally dealt with the artificial oxide referred to in the second analysis, as he doubted the efficiency of an oxide with only 2 per cent. of organic matter and 4 per cent. of moisture.

Mr. Parrish replied that the artificial oxide referred to had the composition quoted when sent from the makers, and would undoubtedly need further treatment before use. He employed both volumetric and gravimetric methods in estimating the iron in the oxides, and thought his scheme of analysis sufficiently accurate for works purposes. The ammonia in the spent oxide he found mainly as sulphate and sulphocyanide. In reply to further questions from members, he stated that the tarry matters among the extracted sulphur contained much naphthalene,

Mr. Scholefield (Dewsbury), Mr. Lang (Clayton), Mr. Whitaker (Wakefield), and others, asked a number of questions regarding the artificial oxide of which analyses of working were given; the general impression being that the claim for not throwing any back-pressure was hardly credible—in fact, it would scarcely hold water, even if the oxide did. Several members also pointed out that the numbers were calculated on the wet basis, and that the only satisfactory method of comparing the results attained in each fouling of the oxide was to calculate the sulphur on the dry basis, inasmuch as the mere loss of water would increase the percentage of sulphur.

Mr. J. F. Smith (Halifax) referred to some of the points raised by Mr. Booth, and stated that the suggested scheme for analyzing new oxide would also give too high a result for organic matter, as the effect would be to reduce some ferric compounds to ferrous. He also doubted the accuracy of the explanation of the action of the ammonia on the nitric acid, especially at the temperature existing, and in the presence of so much inert gas. The method of estimating the ammonia in the spent oxide would, he said, certainly catch the pyridine, and count it as ammonia; while a further error would arise from calculating it as sulphate of ammonia, Mr. Parrish having admitted the presence of some of it as sulphocyanide. In each case the result would appear too high. Aniline waste oxides varied greatly, and he once had to deal with some where the iron existed as magnetic oxide (Fe_3O_4), and much free carbon was present. This specimen was practically valueless, as was painfully evident in actual working. He wished a word of caution had been added to the section dealing with the action of sulphuretted hydrogen on oxide, inasmuch as it was not quite so simple as the common equations represented; polysulphides, &c., being formed, and often an excess of 10 per cent. of sulphur over that accounted for in them. Laming's mixture was not originally devised for removing sulphuretted hydrogen, but for obtaining prussian blue from the gas at a time when that article fetched a very high price. While an analysis of an oxide was very valuable, a test ought never to be omitted showing its actual absorbing power, by passing dry sulphuretted hydrogen over a weighed quantity of oxide duly prepared, retaining the moisture liberated, and calculating the gain in weight. He saw no reason for preferring Mr. Parrish's method of getting a sample to the one generally adopted of "quartering," associated with the names of Lunge and Hurter. The charge of ineffective washing and condensation which the author brought against managers in whose spent oxide tar and ammonia were found, was really a little overdrawn, inasmuch as condensation did not aim at removing as many hydrocarbons as they could, but rather, in the main, at removing as few as possible, while ammonia could reappear in the purifiers after the gas had left the washers clean—often being found in any condensed moisture at the bottom of the boxes. This could arise from the decomposition of cyanogen. He also returned to the question previously raised as to the figures given for successive foulings of an artificial oxide; pointing out that, calculating on the dry basis, the difference between the fifth and sixth foulings was less than 1 per cent. in the sulphur, while on the wet basis there was apparently 5⅓ per cent. increase.

The President thanked Mr. Parrish for having adopted his suggestion as to the topic of the paper, which had proved both interesting and provocative of discussion. He called attention to the need of circumspection in adducing statistics from other men's work; care being necessary to see that the experimenter was a safe guide, and that all the details and accessories of his work were sufficiently known. He greatly doubted whether the analysis given of Weldon Mud was typical, with only 6 per cent. of calcium compounds. As usually made, the "mud" was regarded as a mixture of calcium manganite. He might mention that Mr. Smith had established the fact that gas would have no effect on red litmus paper at the outlet from the washers, and yet contain ammonium carbonylferrocyanide, which decomposed in the oxide—iron replacing the ammonia, which thus appeared in the oxide as ammonium sulphide, &c.

Mr. Parrish, in replying upon the discussion, adhered to the analysis given of Weldon Mud as being that of the variety usually supplied for gas manufacture.

The business then concluded.

The next meeting of the Association will be at Leeds on May 7, when Mr. Hill, of York, will read a paper on "Gas and Ventilation." The President intends giving a paper at the subsequent meeting.

The Plymouth Gas Company have secured the rights of working in that town the brick-making machinery invented by Alderman Lowden, the Chairman of the Gas Committee of the Leeds Corporation, and Mr. John Bond, the former Manager of the New Wortley works of the Corporation.

NEW ENGLAND GAS ENGINEERS ASSOCIATION.

The Thirty-fourth Annual Meeting of the Association was held at Boston (Mass.), under the presidency of Mr. W. E. M'Kay, of that city.

The preliminary business included the election of 9 active and 14 associate members, and of Mr. W. H. Bradley, of New York, as an honorary member. The Secretary and Treasurer (Mr. N. W. Gifford, of New Bedford) reported a satisfactory balance in hand, and a roll of 146 active and 67 ordinary members.

In the course of his Inaugural Address, the President alluded with satisfaction to the development in all directions of the gas business during last year. The shortage of anthracite fuel in the winter had directed attention to the capabilities of gas, and the effects would be permanent. He referred to the increased adaptation of machinery as a natural consequence of the growth of their business, and to the increasing use of steel and cement in the construction of buildings. According to a Census Bulletin issued in 1902, 165 gas-engines, having a total of 12,181-horse power, were in use for generating electricity for lighting, and 15, of 1925-horse power, for electric railways. He remarked that the gas-engine had received careful study on the part of mechanical engineers, who acknowledged that for many purposes it was the most economical agent available. He advised diligent encouragement of the use of these motors, as one 20-horse power engine could use a million cubic feet of gas per annum. They should also follow up the system of maintenance as applied to incandescent lighting. Electrolysis was causing grave concern. There was no known method by which mains could be protected from the effects of single-trolley currents; but where the double current was used all injury ceased. The system of superannuation funds for infirm and retired employees, based on length of service and wages earned, was favourably reviewed. In conclusion, the President said that the duties of managers of gas-works were constantly widening, and the ideal engineer must be not only a scientific, but also a business, man.

Spontaneous Ignition of Coal.

In connection with the prevention of the spontaneous ignition of coal, a report from the Home Insurance Company, New York, was read. It stated that the liability to spontaneous ignition appeared to be most marked in free-burning coals, which included gas coal, and which contained a large percentage of volatile constituents, with a modicum of oxygen; and the tendency to heat was aggravated by the presence of lignite or sulphur, and especially when iron pyrites was present. Dirty or unsorted coal—known as mine run, because it was sold exactly as raised, without being screened or sorted—presented the most decided tendency to heat; and the combination of such coal and any bituminous coal accentuated the probability of spontaneous heating. Apart from the conditions of loading and handling, some coals disintegrated under the action of the atmosphere. But, however produced, the finely divided portions were liable to settle to the bottom of the pile, where they became subject to the effects of pressure and heating. The best authorities agreed that such heating was due to absorption of oxygen, and consequent chemical changes in composition; and that the absorptive quality increased with a rise of temperature, such as might be induced either by pressure or by slow oxidation. The presence of moisture, from unmelted ice or snow, when stowed with the coal or otherwise, promoted self-ignition. It was generally admitted that the presence of sulphur increased the liability; and while no limit had been formulated, it was sometimes assumed that anything over 2½ per cent. was indicative of danger. This point, it was suggested, should be systematically investigated. From the experience gained in handling coal by the railway companies, it was thought that attention to the following details would minimize, if not entirely prevent, spontaneous ignition. No single heap of coal should exceed 1500 tons; and where larger quantities were stored, there should be a perfectly clear space 5 feet wide between each pile. No pile should exceed 12 feet in height when squared, or 15 feet in extreme height; and if under cover or in buildings perfect ventilation should be secured, to facilitate escape of gas. Wet coal, especially when this is due to snow or ice, should not be stored, if it can be avoided. If necessary to store, it should be spread as thinly as possible on the top of the pile. All heaps of bituminous coal, large or small, should be tested regularly and frequently with rods, to discover heating; and the danger limit should be set at about 160° Fahr. Iron pipe should be inserted where desired and maximum registering thermometers introduced so as to locate danger and avoid unnecessary handling of material. Shippers of bituminous coal should in all cases advise consignees of the percentage of sulphur.

Discussion being invited, Mr. Hawken said that last summer he tried the effect of a layer of buckwheat coal about 6 feet thick, on the top of which he placed his bituminous coal. In the pile there was no trouble, but with a pile direct on the ground there was no end of trouble. Horizontal tubes 3½ inches in diameter proved of no use, and the coal fired even in places where it was not piled 5 feet high. When fire showed, he put water into the tubes and saturated the pile. Mr. Norcross had a pile 15 feet high which fired; and the same coal was stored a long time afterwards (but in a pile only 8 or 9 feet high), without giving further trouble. Mr. Allyn thought it was more a question of height than of the weight of coal in a pile. He had experienced much trouble, having had a shed containing 4000 tons of coal on fire from one end to the other, and had to shift all of it. He found that 8 feet was a safe limit; but if the height exceeded this, there was sure to be trouble. He had known coal to fire when thermometers inserted in tubes provided for the purpose failed to show evidence of heating. He preferred digging the coal out, when practicable, to playing on it with the hose-pipe. Mr. Prichard instanced a fire that broke out at 9 feet from the top of the pile, or 16 feet above the bottom (for it was piled 25 feet high), as a proof that pressure was not always the cause.

The St. Louis Exhibition.

In reference to an invitation from the Western Association to join their meeting at St. Louis in June, and visit the Exhibition, Mr. Shelton said that, while the Chicago Exhibition covered 700 acres of ground, that at St. Louis would cover more than 1200 acres, and that the Western Association had secured a space in the centre of one of the main buildings, each of which was 500 feet wide and 750 feet long. Already arrangements had been concluded that would make the second week in June an important one in gas circles. Mr. C. J. Russell Humphreys, speaking in favour of a Gas Congress at St. Louis, referred to what other trades did, and said he thought that in the past the gas industry had suffered by reason of backwardness in taking part in movements of this kind. The proposed congress afforded opportunity for discussions with a breadth of detail that was not practicable at the District Association meeting.

High-Power Lamps.

Mr. T. H. Hintze, of Lowell (Mass.), read a paper on "The Installation and Maintenance of Gas Arc Lamps," enlarging on the advantage of an efficient maintenance system. He said he commenced with eight lamps in March, 1902, and by the end of 1903 had 3000 in use. He sold gas at 3s. 9d. per 1000 cubic feet. He installed the lamps free of cost, and charged 8s. 4d. per lamp per annum, including maintenance. Good service with capable men and regular inspection was the key to his success. Three inspectors were employed, and they cleaned, on an average, 30 lamps per day of nine hours, and used about 100 mantles each per week. Every lamp was reached once in five weeks, and if special attention was necessary in the interim, a telephone call to the office was sufficient. All particulars of materials used were carefully entered up, so that the cost was accurately known. Several mills having their own electric plant were now large customers of gas arc lamps.

In the course of the discussion on the paper, Mr. Campbell remarked that the 3000 lamps cost a considerable sum, and would not last many years; but he did not see any provision for depreciation. Mr. Woodward said he undertook maintenance, with weekly inspection, for 12s. 6d. per annum; and the actual cost to him over the last twelvemonth was 13s. 4d. He preferred to sell right out, even at a loss, rather than have a large investment of capital in goods to be lent on hire. In response to the President, it transpired that seven of the members present were maintaining gas arcs, and that no one, after trial, had rejected the system as unsatisfactory.

In reply to questions, the author said that at 8s. 4d. the scheme just paid its expenses, with no allowance for depreciation. The population of his district was about 100,000, and his sales in 1903 were upwards of 500 millions, or more than 5000 cubic feet per head. His increase for the past two years was 25 per cent. The proposition for arc lamps with gas at 3s. 9d. did not give the private electricity plants at the mills much of a show.

(To be continued.)

GAINSBOROUGH WATER-WORKS.

A Unique Scheme Completed.

Last Wednesday was celebrated the completion of a unique scheme of water supply which has occupied the attention of the Gainsborough Urban District Council for something over ten years. The boring, which is the largest sunk for water-works purposes in the United Kingdom, if not in the world, naturally involved difficulties and delays of no ordinary kind—in fact, owing to the breaking of the boring rope and the burying of the boring tool at a depth of 725 feet from the surface, the work was practically at a standstill for a period of twenty-two months. However, by the exercise of exemplary patience and perseverance on the part of the Contractors (Messrs. E. Timmins and Sons, Limited, of Runcorn), the boring tool was at last recovered, and the boring completed to a total depth of 1515 feet in 1900.

Mr. Jabez Church, having died in 1896, the District Council appointed his partner and successor (Mr. Percy Griffith, M.Inst.C.E., F.G.S.) as Engineer to the scheme; and to him fell the duty of dealing with the pumping machinery required for such an exceptional case. From data obtained at the trial boring, it was estimated that, allowing for the greater depth and the larger diameter of the new boring, as well as for the great depth at

which the pump would be fixed in the latter (300 feet from the surface), the supply would at least amount to 40,000 gallons per hour. To be on the safe side, the capacity of the pump was therefore fixed between a maximum of 60,000 gallons per hour and a minimum of 40,000 gallons per hour, and a double-acting "Concertina" pump, with Ashley's multiple valves, was specified. Contractors were invited to submit their own designs for the engine; and tenders were to be accompanied by a guarantee of duty based upon foot-pounds of water lifted per pound of steam used in the engine. A large number of tenders and designs were received, and the Engineer duly recommended the acceptance of that of Messrs. Combe Barbour, Limited, of Belfast.

The plant being of a unique character, in respect to size, to conditions of working, and to design, the following details will be of interest.

Boilers.—These were already in existence, and comprised two Lancashire boilers, by Messrs. Marshall, Sons, and Co., Limited, 7 ft. 9 in. diameter by 28 ft. 7 in. long, giving a working pressure of 80 lbs. per square inch.

Economizer.—A new economizer, by Messrs. E. Green and Sons, of Wakefield, was inserted in the flues; and as the water was rather hard, a live-steam feed-water heater was fixed for the purpose of arresting the deposit which would otherwise have taken place in the economizer tubes.

Engine.—This was of the inverted vertical type, working compound and condensing. The cylinders are 24 inches and 40½ inches diameter respectively; stroke, 3 feet.

Headgear.—Power is transmitted from the engine to the borehole pumps by means of helical gearing; pinion 4 ft. 6 in., and spur wheel 9 ft. 6 in. diameter respectively. The second motion shaft operates, by means of a crank-shaft and connecting rod, two bell-cranks supported on large extended pedestals so that the motive power operates the lower ends, and the upper and adjacent ends operate the pump-rods. This arrangement was rendered necessary in order to provide head room for the pump cross-heads and guides. The latter are of the usual "slipper" type, and are fixed to the head-gear bed-plate.

Borehole Pump.—This is of a special design, and is the first of its kind ever made. It is of the double-acting or "concertina" type, which obviates the necessity of any independent bottom or suction valve. The pump barrel is 19 inches internal diameter; stroke 3 feet. The valves in both buckets are Ashley's patent multiple valves, by means of which a most exceptional area of water way has been obtained, amounting at its narrowest limits to 60 per cent. of the full area of the barrel. Experience has shown not only the remarkable efficiency of these valves in respect of smooth running and water tightness, but the exceptional facility with which a damaged valve can be repaired or replaced. To secure free access of the water into and out of these valves, both buckets are extended so as to work clear of the pump-barrel, and the adjacent lengths of pump tubes are enlarged in diameter, so that no restriction of area occurs at these points as in the ordinary form of pump.

Pump-Rods.—The inner rod, operating the lower bucket, is of solid circular section, jointed with screwed couplings secured with transverse keys. The outer rods, operating the upper bucket, are hollow tubes, jointed by means of turned spigot-ends secured by steel clams made in halves and bolted together with four small transverse bolts. The rod-guides are of the ordinary spoked wheel pattern. The whole of the machinery in the boring was made by Messrs. Glenfield and Kennedy, of Kilmarnock, as Sub-Contractors.

Force Pumps.—These are two single-acting pumps operated directly from the engine cross-heads, and fixed immediately underneath the engine bed-plate. The valves are also of the multiple type. These pumps deliver the water from surface level to the service reservoirs situated about a mile from the pumping station.

Yield of Boring.—On first starting the pumps it was ascertained that the minimum yield expected—viz., 40,000 gallons per hour—could not be obtained. Since that time, however, the actual yield has increased from 29,000 gallons per hour to 32,000 gallons per hour; and there is every reason to believe that as time goes on the fissures in the sandstone will open out and a still further increase will be secured. The present yield is, however, 50 per cent. in excess of the present requirements of the town, and may be relied upon to afford an ample supply for many years to come. The total outlay upon the scheme has amounted to about £16,500, apart from service reservoirs or rising mains.

The successful completion of this unique and difficult scheme reflects the greatest credit upon all concerned, but more particularly upon Mr. John Dixon, J.P., who has been Chairman of the Water Committee from its inception, and whose perseverance and devoted attention to details have overcome the many and exceptional obstacles that have arisen from time to time. At the formal opening of the works on Wednesday, hearty congratulations were offered to Mr. Dixon by Councillor J. W. Ruddock, the Chairman of the Water Committee of the Lincoln Corporation. It will possibly be remembered that—acting on the advice of eminent geologists—the Lincoln Corporation are carrying out a boring for the purpose of getting a similar supply to that obtained at Gainsborough. This work is also under the supervision of Mr. Percy Griffith.

A GAS MANAGER ON GAS-ENGINES.

At the Annual Meeting of the New England Association of Gas Engineers, a paper on "The Gas-Engine from the Manager's Standpoint," was submitted by Mr. H. W. True, of Boston. The following are some extracts.

Is the gas-engine of any interest to the gas manager; what position does it occupy as a prime-mover; is manufactured gas a suitable fuel for it; can it be depended upon as a reliable consumer of gas; and what methods might be adopted to bring it before your customers? These and many other questions of like nature the gas manager may well ask himself at the present time, when the trade journals abound with illustrations and descriptions of gas-engines for blast-furnace gas, and every month new ones appear of gas-engines which the large steam-engine builders have adopted, and propose to put on the market in connection with systems of producers or coke-ovens. It is to answer in a measure some of these questions that the following paper has been written.

In the first place, one might ask, What has been done with gas-engines? The report of the United States Census Commissioner shows that in 1890 there were in use, in round numbers, 9000-horse power of gas-engines. In 1900, this had increased to 145,000-horse power, or by over 1500 per cent. This represented 15,000 engines of 9·7-horse power each. By far the greater number of these engines used natural gas for their fuel, many others were operated by gasolene, and many, of course, were small engines in pleasure-boats. How many used manufactured gas for fuel I have been unable to discover; but a large manufacturer of gas-engines informed me several years ago that less than 20 per cent. of his engines were used for this purpose. If these engines had all been fairly economical, and used manufactured gas of ordinary quality for fuel, and had been run at an average load of one-third their rated capacity, they would have consumed 3600 million feet, or 60 per cent. of the gas sold in Massachusetts for the year ending July 1, 1902. The above figures certainly show that the gas-engine is here, and here to stay; and if they were run on manufactured gas—their most suitable fuel—the gas companies would have quite an additional income. The statement that manufactured gas is the most suitable fuel for gas-engines is not in line with the usually accepted figures. It is nevertheless true that an engine of given dimensions, diameter of cylinder, stroke, and number of revolutions, will develop more power on manufactured gas than on any other fuel.

A first-class gas-engine will develop, at full load, a brake horse power on 11,000 heat units. Taking the average low heating value of manufactured gas at 600 heat units, this is 18·33 cubic feet per brake horse power per hour; 20 cubic feet, or 12,000 heat units, at half load; and 25 cubic feet, or 15,000 heat units, at one-quarter load. From this it is easy to figure the cost of a horse-power-hour at any price for gas. It is a mistake to take the high heating value of gas in figuring on gas engines and stoves, as the hydrogen of the gas burns to water, and carries off as latent heat about 10 per cent. of the heat of the gas. With gasolene of ·72 sp. gr. at 12c. per gallon, the present market price, we may take the cost of a brake horse-power-hour with gasolene at 1·5c.; with kerosene at 11c. per gallon, a horse power will cost 1⅜c.; and with average gas at $1 per 1000 cubic feet, 1·833c. per horse power. But the losses from evaporation, &c., bring the cost of power from gasolene somewhat higher than with gas; and the greater cost of the engine for kerosene and increased attendance and repairs more than spoil the difference of 0·458c. per horse power.

There is another form of fuel for gas-engines that is little known as yet in America, and that is producer gas. Gas-producers can be had as small as 10-horse power, and their economy is beyond all question. The suction producer does not use any holder, and occupies but little space. It requires the best anthracite stove coal for good results with the smaller sizes. These producers cost at present more than the engine they run, and there are several queries about the small ones; but from 50 up they are all right, and will have to be reckoned with. They will, in connection with a good engine, deliver a brake horse power for 1 lb. of anthracite stove coal. They require about the same attention as the engine, but not a skilled attendant.

I have already shown the fuels and their costs for the gas-engine. I wish now to say a word for its competitors, the steam-engine and the electric motor. In small steam-engines there is no such thing as economy, whether there is automatic cut-off or throttling. Under 50-horse power, on the average load of one-third their nominal rating, they will take 13 lbs. of coal per brake horse power, including that required to run the auxiliaries and bank fires; and maintenance of the boiler will be quite 15 per cent. of its cost per year. The excuse for using such an engine is always, "Oh, we heat with exhaust steam, which costs nothing." But if the users could only see the difference in cost between using the engine for a pump to push that exhaust steam and a good low-pressure or vacuum heating system, it would be a great surprise. With reasonable allowance for interest, maintenance, and attendance, there is not in New England a throttling steam-engine, using steam coal for fuel, and working under ordinary conditions of load, that cannot be replaced by a good gas-engine with average gas at $1 per 1000 cubic feet, and save the user sufficient money to warrant the change.

The electric motor has many good features, and is a very popular source of power. In small sizes, when first cost is an object, and the amount of power used small, it cannot be beaten. Its price is about one-third as much as that of a good gas-engine, and it will cost three times as much to run on the same load. At the size of 10-horse power, with an average load of one-third the nominal rating, with gas at $1 per 1000 cubic feet and electric current at 6c. per kilowatt, the gas-engine will save in one year of 3000 working hours the difference in cost between the motor and the engine. In a first-class engine, 25 cubic feet of standard gas is the same thing as a kilowatt in a first-class motor.

With regard to the most profitable uses for the gas-engine, I would say in general, in any intermittent work the light load losses are practically the friction of the engines, which, of course, remains constant whatever the load. Machine-shops have been the most successful users of gas-engines, perhaps from the fact that they have the attention of mechanics. Foundries find gas-engines most profitable sources of power; printers seem to be the next largest users; sewing-machine work comes next; and ice cream freezers take many small ones. You may now have engines suitable to bolt up to the ceiling and drive shafts direct, or with silent chain drives or belts, in exactly the same way as electric motors. In sizes up to 20-horse power, these would be air-cooled; but the larger ones with water-jackets will give no trouble—the water connections only making some additional piping.

While there are thousands of gas-engines in the country giving perfect satisfaction, there are those that do not, especially on manufactured gas; and one that causes trouble will advertise itself more than a hundred working satisfactorily. I am not going into the details of why this is so; but I am going to suggest a remedy later. If the gas-engine is worth anything to the gas manager, it is certainly worth a little trouble; and if gas companies will take half the pains to look after the gas-engine that they have done to look after gas-stoves, they will get much larger returns from the engine than from the stove. Every horse power of gas-engines installed will be a better customer than a first-class stove; in other words, a 10-horse power engine will consume more gas than ten stoves, although it takes but one service and one meter. This is figured on the bases of the average load being one-third of its rated capacity and 25 cubic feet of gas per horse-power-hour. The experience of several companies has been that they sell about 20,000 cubic feet of gas per annum for each horse power of engines installed. The remedy I wish to suggest for a state of affairs that exists with the gas-engine as used on manufactured gas is this: When a consumer applies for a service for a gas-engine, tell him that you will be most happy to connect one up, but before you do so, you want a written guarantee from the maker of the engine that it will develop the power he claims for it, and do this on a fair amount of gas; and then you will test the engine before it is paid for, and see that it is as represented. This is certainly a fair thing for the three parties concerned, and will save no end of trouble.

As to the reliability of a gas-engine, I have a report of an English engine of 100-horse power that ran 8760 hours in one year, or 96 per cent. of the time. I have heard of some that ran for several months without stopping. Of my personal knowledge, an engine of 15-horse power ran 18 hours a day each working day for more than a year, so loaded that it very seldom missed an explosion, and with little attention. With intelligent supervision and proper arrangements for oiling, there is no reason why a gas-engine cannot run all the time with an hour's shut-down once a month to adjust the wear of the igniters for economy sake.

As to the methods to be pursued to introduce the gas-engine, I have very little advice to offer. What might be advisable for one company might be very bad for another. A note on the gas-engine attached to the bills every month is inexpensive, and will bring some inquiry. Procure a list of the users of steam-engines in your city, and send them regularly each month a few questions such as: "Do you know what your power costs you? Do you know how much power you use? Do you know what it should cost? Do you know what it would cost with a good gas-engine?" In a few months, such questions always bring results.

A few gas companies in America have paid some attention to the gas-engine business, and while they have all had their troubles, the results, so far as I can learn, have been satisfactory. One company made the following statement: "We will contract for, and agree to supply power through, any type of modern gas-engine which merits our approval, on the basis of a fixed price per horse power delivered by the engine wherever placed, and will guarantee a saving of 10 to 50 per cent. over the present cost under any existing system of steam generation of power." Another for some years gave a premium of $5 per horse power to anyone who would sell gas-engines to be used on their mains. Another bought gas-engines, placed them for their customers, and took their money by instalments. One company allowed a discount of 33⅓ per cent. for gas-engines, and another a discount of 40 per cent. But, as I have said, these are matters for various companies to arrange for themselves. It does not matter much what you do, so that you do something. The methods employed with gas-stoves will answer for gas-engines.

A good gas-engine is still rather high-priced. They are bound to be more costly than a steam-engine of the same power, as the four-cycle gas-engine only receives one-fourth the impulses that the steam-engine receives, though the mean effective pressure of the gas-engine is double that of the steam-engine. We may look for a gradual decrease in price with some increase in economy and a perfection of details; but we must not expect any radical changes at present. Considering first cost, maintenance, attendance, economy, and reliability, I believe that in sizes from 10 to 50 horse power the gas-engine running on manufactured gas is the best prime-mover known.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Annual Meeting of the Gas Institution.

SIR,—As a member of the Institution of Gas Engineers, I have received a copy of the letter dated the 16th inst., from the Secretary, Mr. W. T. Dunn, giving particulars of the date of the next annual meeting in London as June 7, 8, and 9. What I desire to ask is, why the date is altered from the second Tuesday in June to the first Tuesday?

Many members have arranged for their Directors' and Committee meetings to be held, avoiding the dates of the week in which the second Tuesday of June falls; and, under these circumstances, unless the old original date is fixed, I fear it will be impossible for many such members to attend the annual meeting.

If other members like myself are affected, I hope they will ventilate the matter through the columns of the "JOURNAL."

A MEMBER FOR 26 YEARS OF THE GAS INSTITUTE.

March 21, 1904.

[From inquiries that have been made, it appears that the question of custom as to the particular Tuesday of June for commencing the annual meeting did not come into the calculation of the Council. Last year, the meeting commenced on Tuesday, June 9; and it was considered that Tuesday, June 7, this year corresponded to that date as nearly as possible. The second Tuesday in June in the days of the Institute seems to have been entirely a matter of custom, and the rules simply confined the Council, in determining upon the time of meeting, to "the month of June." The old Institution were not restricted; nor are the Council of the new Institution. The meeting, it is believed, is to be held at the Institution of Mechanical Engineers as last year; and without doubt the preliminary arrangements have already been definitely made. At the same time, it may be that our correspondent is representing the views of several members, and that their convenience should have consideration.—ED. J. G. L.]

Incandescent Gas Lighting at Morecambe.—Some disappointment is expressed at Morecambe with regard to the incandescent street lighting. The expense has been heavier than was expected; but it is admitted that this is partly the fault of the lighters, who treat the lamps too roughly.

Sales of Taunton Gas Company's Stock.—At Taunton on Monday last week, Messrs. C. R Morris, Sons, and Peard sold £3000 of the new ordinary 7 per cent. stock of the Taunton Gas Company, at prices ranging from £138 10s. to £140 5s. per £100 of stock, and from £69 to £70 5s. for £50 parcels.

Rat Causes an Explosion at Colchester.—A serious explosion occurred in a restaurant at Colchester early on Thursday morning. There was a strong smell of gas about the premises, and the proprietor concluded that the gas-stove had not been turned off overnight. He called his baker, George Roberts, to investigate the matter; and he descended to the basement with a lighted taper for the purpose of doing so. An explosion followed, which blew out part of the shop-front and did considerable damage. Roberts, though cut and burned, had the presence of mind to turn the gas off at the meter. The cause of the escape was a hole gnawed in the service-pipe by a rat.

Visit of Architects to the Gothic Iron-Works.—On Saturday afternoon the members of the Edinburgh Architectural Association had their first visit of the session; the Gothic Iron-Works, Camelon, near Falkirk, being selected. The works, which are the property of Messrs. R. & A. Main, were kept in full operation during the whole afternoon; and the visitors were thereby enabled to witness in process of manufacture, from the raw pig to the finished material, many articles which they are daily specifying in the course of their professional duties. The company, which included several members of the Falkirk Town Council, was divided into sections, and shown over the works by the heads of the firm and the chief officials. The drawing office and pattern shop naturally secured great attention from the architects; while in the meter department much interest was manifested in the new testing apparatus, containing all the latest improvements, which has been constructed for the Town Council. Besides making dry tin case meters, ordinary and slot, Messrs. Main have recently introduced the manufacture of cast-iron meters, for which there is already a good demand. Part of the site of the works is on the Roman camp discovered some time ago at Camelon, and within it is one of the largest and best preserved pieces of the Roman wall in Scotland. It has been suggested to Messrs. Main that this interesting relic of the Roman occupation should be uncovered, and railed off; and we understand it is being favourably entertained by the firm. An address on the character and extent of the Roman remains in the neighbourhood, by Mr. Thomas Ross, F.S.A., formed a pleasing interlude in the afternoon's proceedings. The party were hospitably entertained by Messrs. Main, who were cordially thanked for their kindness.

PARLIAMENTARY INTELLIGENCE.

GLEANINGS FROM THE COMMITTEE ROOMS.

THE week in the Committee Rooms has been absolutely barren of all gas and water discussion in respect of opposed measures; and only in the Court of Referees has there been any controversy upon a matter directly assailing the interests of a Gas Company. There the South Metropolitan Gas Company were present to support their petition for *locus standi* in connection with the London, Camberwell, and Dulwich Tramways Bill. Among other work incidental to the construction of this tramway is the widening of Rye Lane, Peckham, which is a more important thoroughfare than to a stranger the name alone would betoken. The Company made the reasonable request that they should be allowed to be heard, before the Committee who would consider the Bill, against any alteration of their pipes in Rye Lane and other streets, without satisfactory protection. This they do not consider is given them by sections 30 and 31 of the Tramways Act; and, as a matter of fact, the sections are not so just to the owners of pipes providing public supplies as a clause in the 1891 Improvement Act of the London County Council. This clause gives pipe-owning companies the right to execute any necessary alterations themselves, and provides for the refunding to them of the costs. Apparently, in the opinion of the Court, the clauses in the Tramways Act are sufficient; for they disallowed the *locus*. If the adequate protection that is desirable in such cases is to be secured, very persistent effort will have to be made. The Court of Referees do not, it is clear, appreciate the gravity of the position. Perhaps when the Metropolitan Water Board settle down to their work as water distributors, they will bring their weight to bear upon this important matter as opportunity arises.

Tramways and Pipes.

An Ambiguous Variation of the Bermondsey Clause.

The Gaslight and Coke Company were also appearing during the week in opposition, as large ratepayers, to the Bill promoted by the Borough Council of Marylebone in connection with their famous purchase of the electric supply undertaking. The Gas Company's opposition was not of a far-reaching character, though to the ratepayers their object was of the greatest import. What they principally sought was the bringing into agreement with the Bermondsey clause of one already existing in the Bill, and which had been inserted to rid the promoters of the opposition of the Great Central Railway Company. In this clause (the terms of which are quoted in full in another column) are words which are not so innocent as, on the first blush, they may appear; and they, in fact, on examination, open to view the possibility of the value of the clause being entirely undermined by the latitude they give. The words will be found some dozen or so lines down in the text of the clause in our report; and they are the ones italicized here. The clause says: ". . . so far as is reasonably practicable (*having regard to any steps which the Council may decide to take to decrease the expenses or increase the revenue of the undertaking*), the revenue for that year shall not be less than the estimated amount of the charges on revenue account and of the charges for interest and sinking fund for that year." The italicized provision, equivocal though it is, is not so much so that it cannot be seen that it is sufficient to enable the Council to escape altogether from the intention of the original Bermondsey clause. That the Great Central Railway should have accepted "hands down," in satisfaction of their objections, the clause with such a sinister condition in it, passes understanding. Nobody, of course, is likely to object to the Council decreasing their expenses; but they may decide to attempt to increase the revenue by lowering the price to a point which, in the result, will make the revenue less than the estimated amount of the charges on revenue account and for interest and sinking fund. What is to prevent them doing this? Their action in such a case, and even year after year, would be fully protected by the words in question. However, the Gaslight and Coke Company, represented by Mr. Balfour Browne, K.C., and Mr. Erskine Pollock, K.C. (with Mr. D. Milne Watson, the General Manager of the Company, in attendance to render any necessary assistance) did all that was possible to secure the extirpation of the objectionable words. But they were unsuccessful; and the Bill goes forward containing a clause made by those words almost worthless. There is a further condition in the clause, the meaning of which might be the subject of dispute. The clause is not to have effect until "after the expiration of three years from the commencement of the Order of 1901." It is supposed that the intention of this is that the clause is not to have effect until after the lapse of three years from the time the Council commence to put the powers of the Order into operation.

General.

The foregoing are the only points about last week's work that are worth noting here. There was really very little doing even in connection with measures of other classes. Among general matters, the Barnet District Gas and Water Bill got through the second reading on Wednesday night. But nevertheless there is the strongest opposition to the measure on the part of the Hertfordshire members, in view of the fact that a part of the Company's district is in Middlesex. The Local Authorities of Hertfordshire are of opinion that the Company's water undertaking will eventually come under the Metropolitan Water Board; and they object to the water of Hertfordshire being used for the people of Middlesex. It looks as though there will be a big opposition to be met when the Bill is before Committee. The Amersham, Beaconsfield, and District Water Bill was also read a second time early in the week; and, after the uncertainty which has surrounded its recent movements in the opposed lists, this one step forward is something for which the promoters must be thankful. It is stated that the Company have the support of every Local Authority who are interested in seeing that this particular district of Bucks is properly supplied with water. Several Bills have been passed from one House to the other; and there are some (not gas or water) awaiting the Royal Assent. Certainly no time is being lost this session. To-day the motion for the adjournment of the Commons over Easter is to be made by Mr. Balfour. Immediately after the reassembling of Parliament, additional Commons Committees (who have been named, and have had groups of Bills referred to them) will commence their sittings. Electricity and Power Gas Bills, the Barnet and Amersham Bills, and even the Crystal Palace District Gas Bill are found in their lists. The last-named Bill, however, is still waiting to be read a second time in the House. The petitions of the Camberwell Borough Council and of the London County Council against the Bill are objected to, and were down for the consideration of the Court of Referees last week. The matter, however, has since been postponed. A week later than the Commons, new Committees of the Lords will begin the consideration of groups of Bills, in which are found electrical and power gas, water, and tramways measures.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bills brought from the Commons and read the first time: Bexhill Water and Gas Bill, Chippenham Gas Bill, Felixstowe Gas Bill, Gomersal Gas Bill, Kirkby-in-Ashfield Urban District Gas Bill, Littlestone-on-Sea and District Water Bill, Norwich Water Bill, Sheppy Gas Bill, South Shields Gas Bill, and Wellington (Somerset) Gas Bill.

Bills read a second time: Corbridge Gas Bill, Hampton-in-Arden Gas Bill, and Whitby Gas Bill.

Bills reported: Barnard Castle Gas Bill, Barrow-in-Furness Corporation Bill, Gosport Water Bill, Huddersfield Corporation Act, 1902 (Amendment), Bill, New River Company Bill, Southend Water Bill, Ticehurst and District Water and Gas Bill, and Yorktown and Blackwater Gas Bill.

Bills read the third time and passed: Harlow and Sawbridgeworth Gas Bill, Matlock and District Gas Bill, Southend Water Bill, Ticehurst and District Water and Gas Bill, Tynemouth Gas Bill, and Yorktown and Blackwater Gas Bill.

The Ebbw Vale Urban District Water Bill, the Harrogate Water-Works Tramroad Bill, and the Leeds Corporation (Water-Works) Railway Bill have been referred to a Select Committee, consisting of the Earl of Camperdown (Chairman), Earl Craven, Lord Boston, Lord Shute, and Lord Biddulph; to meet on Thursday, April 21.

The Belfast and North-East Ireland Electricity and Power Gas Bill and the Derwent Valley Water Board Bill have been referred to a Select Committee, consisting of the Earl of Lauderdale (Chairman), Earl Beauchamp, Lord Saltoun, Lord Monteagle of Brandon, and Lord Estcourt; to meet on Thursday, April 21.

HOUSE OF COMMONS.

Wednesday, March 23.

BARNET DISTRICT GAS AND WATER BILL.

On the order for the second reading of this Bill,

Mr. HUDSON said he desired to protest against the second reading, lest, in the absence of such a protest, it might be thought that the Bill was unopposed. As a matter of fact, all the Local Authorities in his part of Hertfordshire (Hitchin), as well as the Hertfordshire County Council, were in opposition to it. No doubt the honourable member for Mid-Herts (Mr. Slack) would speak in favour of the second reading, because certain of his constituents were affected by the Bill; but what he (Mr. Hudson) objected to was the aggression of the Water Companies. First of all they applied for small powers to take water from Hertfordshire to supply villages in the county, and shortly afterwards extended their operations to places in other counties. In the present case, two-thirds of the water obtained in Hertfordshire would be supplied to Middlesex. The people of Hertfordshire had had to pay no less than £27,000 in defending their water; and they resented its being taken to supply other counties. The Water Company specially concerned would eventually come under the Metropolitan Water Board, and the result would be that millions of gallons of water would be supplied at the expense of Hertfordshire to people who ought to obtain it from another source. This was a thing they strongly protested against. While allowing the Bill to pass the present stage, he reserved his right to oppose it in Committee.

Mr. COHEN ridiculed the suggestion that the Bill intended to impoverish the water supply of Hertfordshire for the benefit of Middlesex. He pointed out that eight of twelve places intended to be supplied were in Hertfordshire itself, and therefore the county would in this way have returned two-thirds of the water drawn from it. The promoters of the Bill would gladly consider any reasonable conditions Mr. Hudson might bring before them; and therefore any grievance which the Hertfordshire people felt could be considered before, and adjudicated upon by, the Select Committee, which, in his opinion, was the only competent authority to decide these questions.

Mr. SLACK supported the second reading of the Bill, because part of Barnet was in his constituency, and the people of that town were urgently in need of a constant and efficient supply of water. This could only be given by the Barnet Company; and therefore he asked that the measure should be allowed to go forward.

The Bill was then read a second time.

The following further progress has been made with Bills:—

Bills brought from the Lords and read the first time: Harlow and Sawbridgeworth Gas Bill, Matlock and District Gas Bill, Ticehurst and District Water and Gas Bill, Tynemouth Gas Bill, and Yorktown and Blackwater Gas Bill.

Bill read a second time: Amersham, Beaconsfield, and District Water Bill.

Bill reported: Colney Hatch Gas Bill.

Bills read the third time and passed: Bexhill Water and Gas Bill, Chippenham Gas Bill, Felixstowe Gas Bill, Gomersal Gas Bill, Kirkby-in-Ashfield Urban District Gas Bill, Littlestone-on-Sea and District Water Bill, Norwich Water Bill, Sheppy Gas Bill, South Shields Gas Bill, and Wellington (Somerset) Gas Bill.

The Cheshire Electricity and Power Gas Bill and the North-Western Electricity and Power Gas Bill have been referred to a Select Committee, consisting of Mr. Cawley (Chairman), Colonel Denny, Dr. Hutchinson, and Mr. Remnant; to meet on Wednesday, April 13.

The Amersham, Beaconsfield, and District Water Bill, the Barnet District Gas and Water Bill, and the Crystal Palace District Gas Bill have been referred to a Select Committee, consisting of Captain Jessel (Chairman), Mr. Trevelyan, Mr. Reid, and Mr. Crooks; to meet on Wednesday, April 13.

COURT OF REFEREES.—Thursday, March 24.

THE SOUTH METROPOLITAN GAS COMPANY AND THE CAMBERWELL AND DULWICH TRAMWAYS BILL.

The Bill promoted by the London, Camberwell and Dulwich Tramways Company came before the Court to-day in connection with a petition presented by the South Metropolitan Gas Company. Mr. J. W. Lowther presided; and Sir Chandos Leigh (the Speaker's Counsel) was in attendance.

Mr. Balfour Browne, in the interest of the Gas Company, stated that the Bill proposed the widening of Rye Lane, Peckham; and he asked for *locus standi* to be heard against alteration of the position of the Company's mains and pipes in the streets. The objection to the *locus* was, generally, that the case of the Gas Company was covered by sections 30 and 31 of the Tramways Act; and though these sections did look like covering them, they failed in certain respects. One of the most important features in the clause given in London was that where pipes where relaid under the Tramways Act, they could be relaid anywhere in the streets that the tramway company chose, so long as the terms of the Act of Parliament were complied with. Therefore, if there was no limitation as to depth, the pipes might be put 10 feet beneath the surface or only 2 inches. If they were laid too near the surface, there would be serious danger of their becoming broken. In the London clause, there was a provision to the effect that the street should not be lowered or raised, or the position of any gas pipe or main altered, so as to leave a covering of less than 2 feet of soil, unless artificial covering, approved of by the engineer to the gas company, were used. This was most important to his clients, because, unless the pipes and mains were protected, they might get broken, and a great deal of gas would be lost.

Sir Chandos Leigh: Do you attach any importance to the electrification of the tramway?

Mr. Balfour Browne: No; because there are clauses which give electrolytic action the go-by. Clause 49 of the London County Council Improvement Act of 1891 was totally different from the Tramways Act, and was most important. It said that after seven days' notice, if the company wished, they could execute such alterations to their mains and pipes as might be necessary, and the cost should be repaid to them. A gas company was more familiar with pipes and mains than a tramway company; and in this case his clients wanted to go before the Select Committee and to be able to say "We are entitled to the same protection as that which has been given, even against a local authority like the London County Council." He therefore asked for *locus standi*. It was conceded in the case of Erith last year without opposition.

A Member of the Court asked why there should be a difference made between London and places outside?

Mr. Balfour Browne: I do not know; but it is true that in one or two cases you thought that sections 30 and 31 of the Tramways Act were sufficient.

The Court: Do you see any distinction?

Mr. Balfour Browne: No; except in the magnitude and importance of the London undertakings. Power has been given to the Companies in London to do this work for themselves. The clauses of the Tramways Act are not sufficient, as is shown by the provision mentioned as being inserted in Acts, even against the London County Council.

The Court: That does not prove the case for the *locus*.

Mr. Balfour Browne: But it shows what is reasonable in London; and the Court has a discretion in the matter. All we want is to go before the Committee and say we should have the same protection in Camberwell as we have in Erith.

Mr. Honoratus Lloyd, for the promoters, submitted that the Gas Company should not have *locus standi*. The one thing which the Court were in agreement with itself on, year after year, was that the tramway clauses were sufficient. The decision of the Court had varied on the question of electrolytic action and on other points; but on this particular point, the existing clauses had held good for 34 years, and it was difficult to conceive how they could be objected to now, looking at the number of miles of tramway that had been laid down in London. The point was raised on the Airdrie and Coatbridge Bill; and ——

The Chairman: We will not trouble you further. The *locus* will be disallowed.

Reduction in Price at Retford.—The Retford Town Council have decided to reduce the price of gas to ordinary consumers by 3d. per 1000 cubic feet, to 2s. 11d., with 5 per cent. discount if paid within the stipulated time; to give 22 cubic feet for 1d. to prepayment meter users, instead of 20 feet; to encourage the use of gas for motive power purposes by giving an extra 5 per cent. discount, making 10 per cent., provided the gas is registered through a separate meter and the account paid within the stipulated time; and to benefit the general ratepayers by reducing the charge for the street-lamps by 10s. each per annum.

THE MARYLEBONE ELECTRIC LIGHTING QUESTION.

The Parliamentary Inquiry—A Modified Bermondsey Clause.

A Select Committee of the House of Commons, presided over by Sir A. Hargreaves Brown, began on Monday last week the consideration of the Bill promoted by the Borough Council of Marylebone to obtain further powers in regard to the supply of electricity, and authority to raise £1,881,444 in respect thereof. The promoters were represented by Mr. J. D. Fitzgerald, K.C., Mr. Honoratus Lloyd, K.C., Mr. Vesey Knox, and Mr. A. B. Caine. The petitioners against the Bill included the London County Council, represented by Mr. Freeman, K.C., and Mr. Talbot; the Gaslight and Coke Company, by Mr. Balfour Browne, K.C., and Mr. Erskine Pollock; and the Metropolitan Electric Supply Company, for whom Mr. Balfour Browne, K.C., appeared.

The case for the Council was opened by Mr. Fitzgerald, who traced the history of the electric lighting question in Marylebone from the time that a Provisional Order was granted to the Metropolitan Electric Supply Company down to the agreement of the Borough Council to purchase so much of the Company's undertaking as was within their limits, at the arbitration price of £1,212,000. To this sum, he said, had to be added the capital expenditure of the Company in the district after Dec. 31, 1901, the expenses connected with the arbitration, and other matters; so that the total amount to be paid by the Council was £1,365,000. The first object of the Bill was to invest the Council with the necessary powers to raise the purchase-money; the next was to enable them to borrow a further sum of £460,000 for the acquisition of land and the construction and equipment of a generating station. The Local Government Board had presented a report on the Bill, and had suggested various alterations, many of which had been carried into effect. The Council asked for 42 years for the repayment of the loan—a period which Parliament had sanctioned in the case of the purchase of the electric light undertaking by the Liverpool Corporation. The opposition of the London County Council was not really directed against the preamble of the Bill; while that of the Gaslight and Coke Company was against the amendments which had been made in it. He had a difficulty in understanding how the Electric Supply Company had the right to intervene. The Company had obtained judgment against the Council, and they would be paid first. The Chairman suggested that, in the absence of any provision in the Bill, payment might be postponed while a new generating station was being constructed. Mr. Fitzgerald said the Council could not supply electricity until they had completed the purchase; and terms had been arranged by which the Company, pending the construction of a generating station, would supply electricity in bulk. The first witness called was Mr. Ernest Debenham, the Chairman of the Electrical Supply Committee of the Council, who explained generally the purposes of the Bill; and with his evidence the proceedings closed for the day.

On resuming on Wednesday morning, Mr. Freeman stated that arrangements had been definitely come to between the Borough Council and the London County Council with reference to the borrowing powers sought under the Bill. What the County Council were prepared to do was to make provision in their Money Bill of 1904 which would enable them, if the Borough Council were authorized to borrow money, to lend them £1,365,000. To enable this loan to be advanced temporarily, power would be sought in the Money Bill to issue County Council Bills to an amount not exceeding £1,500,000, and, subsequently, when the occasion arose, steps would be taken to make a permanent loan. The County Council would also be prepared to advance to the Borough Council a sum of £100,000, the amount which it was estimated would be required for the first instalment of the electric lighting works during the current year. This they could do, as they had parliamentary sanction to borrow on short loan by means of bills year after year.

The clauses of the Bill in which the Gaslight and Coke Company were specially concerned ran as follows:—

> (1) The Council shall, once in every year in which they shall themselves work the undertaking after the expiration of three years from the commencement of the Order of 1901, cause to be laid before them a statement and balance-sheet of the accounts of the electric lighting undertaking drawn up in accordance with the form of accounts prescribed by the Board of Trade for a local authority under the Electric Lighting Acts, 1882 and 1888; and the Council shall thereupon fix annually the charges to be made for the supply of electrical energy in the then ensuing year at such rates, not exceeding the maximum rates specified in the Order of 1901, or in the case of consumers charged in pursuance of the section of this Act whereof the marginal note is "Power to Charge according to Maximum Demand," not exceeding the maximum rates authorized by that section, that, so far as is reasonably practicable (having regard to any steps which the Council may decide to take to decrease the expenses or increase the revenue of the undertaking), the revenue for that year shall not be less than the estimated amount of the charges on revenue account and of the charges for interest and sinking fund for that year: (2) Provided that nothing in this section contained shall prevent the Council from entering into contracts under special circumstances with particular consumers to supply electricity at prices fixed by the contracts: (3) Provided also that if the Council shall enter into arrangements by way of lease or otherwise with any company to work the undertaking on their behalf, they shall condition such arrangements so that the Council shall be entitled to receive from such company, by way of rent or otherwise, in each year, a sum not less than the estimated annual amount of the charges for interest and sinking fund.

Mr. Debenham was recalled for further cross-examination on these points. In answer to Mr. Pollock, he said it was proposed to publish a statement and balance-sheet of the accounts of the undertaking; and, as far as he knew, there was no objection to the clause in the Bill being altered so that the accounts should be "published for the information of the ratepayers." Counsel asked the witness to explain the meaning of the words, which he believed were new, "having regard to any steps which the Council may decide to take to decrease the expenses or increase the revenue of the undertaking." He said he understood them to mean that it was conceivable that the Council might, in other ways than by raising the price, so work the undertaking that there should

not be a loss upon the rates. Counsel remarked if this was all that was meant, it was included in the words "so far as is reasonably practicable." Witness said he should imagine it was. It was put to him that, under the agreement clause, the whole work of electric lighting in Marylebone might be handed over to a limited liability company for ten years, on terms over which neither Parliament nor the Board of Trade could have control. He replied that he did not appreciate this. As far as he knew, he should not object to the agreement, if proposed, being subject to the approval of the Board of Trade. Mr. Pollock suggested that the Board should also have power, if they thought fit, to hear any parties interested in such agreement. Mr. Fitzgerald remarked that this question was one for him, as Counsel, not for the witness. Some discussion followed, and ultimately the Chairman said that, from the point of view of the Gaslight and Coke Company, it appeared that the question did not arise, though it would be one for the Committee to consider. Mr. Pollock maintained that it did concern the Company, because any improvidence would affect them, seeing that they were very large ratepayers.

In reply to further questions, Mr. Debenham said it was the present intention of the Borough Council to start a generating station, and undertake the supply of electricity themselves; but they had felt bound to see whether any contracting company would give more favourable terms than those upon which they could do the work themselves. A member of the Committee (Mr. Palmer) asked the witness what reasons he had for anticipating that he would get more advantageous terms than those offered by the Metropolitan Company; and he replied that the electrical Supply Committee had been advised that it was impossible that the Company could compete with a supply generated in the borough. But before the Council did the work themselves, it was understood that the Committee would see if it could be carried out more cheaply by a contracting company. In reply to the Chairman, witness said he did not think it would be necessary to have a rate, if they were allowed a period of 42 years for the repayment of the loan, and the suspension of the payments to the sinking fund for the first two years.

The next witness was Mr. Arthur Wright, the Council's Consulting Electrical Engineer, who stated that, if their powers were transferred to a contracting company, the Council would be spared the worry of the difficult problem of converting the present mixed system into one general system of electric lighting; but they would not save either in the matter of generating plant or of production. The cost to the ratepayers in these respects would be the same. Thereupon Mr. Palmer asked witness what was the object of the additional provision. Mr. Wright replied that, as far as he could understand, the clause was inserted to enable the Council, having purchased the undertaking, to get a contractor to carry them through the difficult period of the first three or four years, if they decided that this was better than working the undertaking themselves. Without the clause, the Council must do the work themselves. The Chairman suggested whether it was not reasonable, in a matter of such great importance to the ratepayers, that statutory sanction should be given to any such contract, making it binding on both parties. He pointed out that the contract, if entered into, would involve the lighting of Marylebone for a period of ten years. The witness replied that he quite appreciated the importance of the point; but he urged that the ratepayers were saved all risk of making a loss on the trading during the early years. The contracting Company undertook, in an informal offer which had been made to the Council, to ensure the ratepayers against any loss. A binding contract could not be made until Parliament had settled the number of years for the repayment of the money borrowed.

Mr. Wright was followed by Mr. A. B. Holmes, the Consulting Electrical Engineer to the Liverpool Corporation, whose evidence brought the promoters' case to a close.

The Committee were then addressed by Mr. Balfour Browne on behalf of the Metropolitan Electric Supply Company. He said he was concerned to preserve the agreement the Council had made with the Company in regard to taking from them any electricity beyond what they could generate themselves. This was a binding agreement, and should be made obligatory by insertion in the Bill.

Mr. Erskine Pollock contended that if there was to be in the Bill a clause sanctioning an agreement with another company, it ought to be under the control of somebody. As the clause stood, it would allow the agreement to be entered into with nobody to control the action of the Local Authority in the matter. He suggested that the Board of Trade would be the proper authority to approve of the clause, and the drafting could easily provide that the approval of the Department should not be required if a proposed agreement related only to a small matter, such as the supply of electrical fittings. Beyond the approval of the Board of Trade, means should exist by which bodies interested might intervene and call the attention of the Board to the form of the agreement. With regard to the Bermondsey clause, he argued that if it was to go into the Bill it should be effective. As it stood it was not. In particular, he objected to the words "having regard to any steps which the Council may decide to take to decrease the expenses or increase the revenue of the undertaking," because they might be used to fetter the provision so that it would not carry out the intention of the clause. He much preferred the words "reasonably practicable." Then the clause said "the revenue for that year shall not be less than the estimated amount of the charges," &c. This should be "the proper charges," which would include everything. The provision as to laying before the Council a statement and balance-sheet of the accounts of the undertaking would not be the same as the publication to the borough and ratepayers; and therefore the meaning should be made clear by inserting "cause to be laid before them, and published for the information of the ratepayers." They were told that a considerable portion of the land to be used already belonged to the borough. The Council therefore ought to credit the general municipal accounts with the proper rent of the land, and this figure should appear in the electric lighting accounts. To meet the difficulty, some such words as these would be required—"on which the full marketable value of any lands appropriated for the purpose of the undertaking shall be charged to the capital account of the undertaking; and shall cause such statement and balance-sheet to be published for the information of the ratepayers."

The Chairman asked Mr. Pollock how a clause of this sort would carry the matter any farther than the audit of public accounts which was now undertaken on behalf of the Local Government Board annually. Counsel replied that, in estimating the price of electric light for the ensuing year, they had to base the figure on the revenue for the preceding year; and therefore they could not arbitrarily put it down at a very low rate, and so cause a large deficit, which might ensue, to fall upon the district rate. They would have to base their price on the sum they were receiving the year before. The Chairman remarked that, as all these accounts had to be audited by the Local Government Board, it appeared to him that Counsel assumed that this audit did not properly disclose all the cost or profit or loss of the undertaking. Mr. Pollock pointed out that the audit of the accounts would only show what had happened after the year was over. The object of the clause was that the municipal authority should act on a sound commercial basis, and charge for the electric light what, in fact, it cost. Mr. Allen (a member of the Committee) asked Counsel if his contention was that the words within the parentheses practically made the clause nugatory. Mr. Pollock replied that the petitioners thought they might be used for this purpose. He concluded by referring to various cases in which the Bermondsey clause had been inserted in Bills.

On the re-assembling of the Committee on Thursday, Mr. Honoratus Lloyd, replying on behalf of the promoters, said there was not the slightest intention to depart from the terms of the agreement arrived at with the Metropolitan Company By it the promoters undertook to take in bulk any electricity they might require beyond that which they generated for themselves; and from this position they had no intention to depart. To make the matter clear, they would make an addition to the clause confirming the agreement for the supply of energy by the Company to the Council, as follows: "And in the event of the Council entering into any agreement with any working company under the next succeeding section, such agreement with the company shall be binding upon the working company as if that company had been a party thereto." Mr. Palmer asked Counsel if there was any instance in previous legislation in which, there being an electric lighting company in existence, such an arrangement with a second electric company as the one proposed had been allowed. Mr. Lloyd acknowledged that he knew of no instance, nor had there ever been similar circumstances. Originally it was contemplated that the system should be self-contained, with a generating station within the borough. Mr. Palmer asked if there was any prohibition to placing the generating station of the Company outside Marylebone. Mr. Lloyd said there was not such a prohibition in the Bill; but there was provision for the acquisition of land for the purpose within the borough. He would be prepared to add a proviso that no transfer of powers should be made without the assent of the Board of Trade. The Chairman said this would ordinarily be sufficient; but the present case was peculiar. Here one Company was being bought out, and a contract was made with them; and then it was proposed to put another in their place. He expressed a desire to have the views of the Local Government Board on this matter.

Thereupon, Mr. H. E. Boyce, the Parliamentary Agent to the Local Government Board, was called, and said the period of the loan would be at the discretion of the Committee; and he suggested that they should have exact figures showing revenue and payments over a series of years, and the amount of aid required from the rates. They would then see the effect on the ratepayers, and fix the period for repayment. The term of 42 years was a long one, in the opinion of the Board; but the amount was large. Mr. Fitzgerald remarked that, in paying the capitalized value of prospective interest, it would be difficult for the first few years to carry on the undertaking at a profit; and it appeared reasonable to the Council to spread the loss over the first ten years. The Chairman said the Committee wished to have some information as to the effect of 42 years as compared with 35 years as the period for repayment; and Mr. Wright was recalled for the purpose of giving it. He said he calculated on the basis of the price agreed upon with the Metropolitan Company for supply, and if the suspension of the sinking fund and the deferment of interest were not allowed, the loss in the first year of the undertaking would be £25,500; and if coal prices were to rise 15 per cent., the loss would be £29,480. The first year under the working of the new generating station would show a small margin of profit. Proceeding with his calculations, he estimated that, on a basis of 35 years, in the second year of operation the profit would not allow a reduction of 10 per cent. to the consumers.

After a lengthened consultation in private, the Committee declared the preamble of the Bill proved, but required certain alterations in clauses. They considered that 38 years should be the period for repayment of the loan, with suspension for three years; they would not add to the Bill the clause giving power to the Council to lease to a new company; and they adopted the accounts clause (1) as it stood.

Gas for Workhouse Lighting at Salisbury.—At the last meeting of the Salisbury Board of Guardians, the Clerk reported that he had obtained tenders for the lighting of the workhouse from the Electric Lighting and Gas Companies. The former agreed to lay their main into the building free of charge if the Board adopted their system. The Company would supply 174 lights complete with the fittings for a cash cost of £193, 80 per cent. of which should be paid on the completion of the work, and the remainder after three months' satisfactory working. If the Board thought it desirable, payment could be made in 28 quarterly instalments of £8 2s. 6d.; the first of these to become due upon the completion of the work. The Company would maintain the installation at a cost of £16 per annum, and the price of the light would be 4d. per unit. The Gas Company's tender stated that the estimated cost of gas-fittings for the house was £100, which could be paid off, if thought desirable, in ten half-yearly instalments of £10 10s. The yearly maintenance of the fittings would be undertaken for £15 10s., and the cost of the gas consumed was estimated at £39 a year. Mr. R. M. Hall proposed that the Board should accept the Gas Company's tender. Mr. Carey seconded the motion, and said the Guardians had to consider the comfort of the inmates and the ratepayers' pockets. An amendment was proposed to retain the present system of oil lighting; but it was lost by 24 votes to 6, and the motion carried.

HOUSE OF COMMONS COMMITTEE.

Monday, March 14.

(*Before Mr.* CREMER, *Chairman, the Hon.* S. F. ORMESBY-GORE, *Captain* ELLICE, *and Colonel* TUFNELL.)

SHEPPEY GAS BILL.

The object of this Bill is to authorize the Sheppey Gas Company to raise further capital, and to confer further powers upon them.

Mr. WEDDERBURN, K.C., and Mr. LAWTON appeared for the promoters; while Mr. CLAUDE BAGGALLAY, K.C., and Mr. RAM, K.C., represented the only petitioners in opposition—the Leysdown and Shellness Estates, Limited, and Mr. G. H. Dorrell.

Mr. WEDDERBURN, in opening, said the Sheppey Gas Company was founded in 1857 as a limited liability Company, and became statutory in 1871. They supplied gas throughout the Isle of Sheppey, which included Sheerness and Queenboro'—two places which had a population of 20,000 and an area of 1100 acres. In the district were the parishes of Minster and West Minster; but, by the inadvertence of a copyist, West Minster only was inserted in the Act of 1871, the result being that Minster was cut out from the area of supply. One object of the Bill was to rectify this mistake. Other proposals were to consolidate the stock of the Company, to increase the capital to a total of £63,000, with the usual borrowing powers, and to establish insurance and renewals funds on the usual lines. The only opposition came from landowners in the Company's area; one being the Leysdown and Shellness Estates Company, who possessed land which they hoped to develop for building purposes, and Mr. Dorrell, who held property in Leysdown and Harty. The clauses to which these petitioners had a right to object had all been withdrawn, with the exception of clause 48, which conferred additional powers on the Company in regard to the supply of power gas. The Company did not want to supply power gas to the petitioners, and would be content to limit these powers to the parishes of Queenboro', Sheerness, and Minster, omitting in this respect all other parishes (including those in which the property of the petitioners was situated) from the Bill.

Mr. RAM said this would not meet the objection of the petitioners. The Company had had power to supply them with gas, but had never done so. If the additional authority sought were granted to the promoters, a clause should be inserted limiting the exercise of these powers to a certain time—say, two or three years—and providing that if they did not within this period supply gas to the petitioners, they should be at liberty to supply themselves. For thirty years the Company had never supplied the petitioners with gas.

Mr. WEDDERBURN said that was because no application had ever been made to them to do so.

The CHAIRMAN, after conferring in private with his colleagues, said the Committee thought the point a very trivial one; and they therefore suggested an adjournment to enable the parties to confer with a view to coming to an agreement.

After a short adjournment,

Mr. WEDDERBURN informed the Committee that they would not be troubled with the Bill.

Mr. *V. H. Stallon*, Solicitor to the Sheppey Gas Company, then gave formal proof of the preamble.

Mr. WEDDERBURN said the promoters had decided to strike out clause 48.

Mr. RAM pointed out that, by adopting this course, he was precluded from saying anything about the clause. It was no longer open to him to ask for a limit of time; and therefore there could be no such limit unless the Committee thought fit to insert it. To meet objections advanced by the petitioners, the promoters, before coming to the Committee, had struck out other clauses; and if they had struck out clause 48 before the Committee had the Bill before them, his clients would have been saved the expense of appearing. In these circumstances, he asked to be allowed the costs of the opposition.

Some discussion took place, in the course of which Mr. Wedderburn characterized the application as grossly improper, and, in the result, the Committee refused to accede to the request.

The preamble was then found proved; and the clauses having been adjusted, the Bill, as amended, was ordered to be reported to the House for third reading.

HOUSE OF COMMONS COMMITTEE.

Tuesday, March 8.

(*Before Mr.* FISON, *Chairman, Mr.* SOAMES, *Mr.* REGINALD LUCAS, *and Mr.* RUNCIMAN.)

LITTLESTONE-ON-SEA AND DISTRICT WATER BILL.

The object of this Bill was to incorporate the Littlestone-on-Sea and District Water Company, to construct certain works, and to get power to supply New Romney and Lydd, and the parishes of Dimchurch, Hope All Saints, and St. Mary in the Marsh, in Romney Marshes.

Mr. FREEMAN, K.C., and Mr. MUNROE represented the promoters; and Mr. WEDDERBURN, K.C., and Mr. HUTCHINSON appeared for the New Romney Corporation.

Mr. FREEMAN, in opening, said in 1882 two private owners—Mr. H. T. Tubbs and Mr. Lewis—determined to make a new watering place, and agreed to purchase for the purpose, from the New Romney Corporation, 330 acres of the foreshore which now formed the district of Littlestone and Greatstone. The purchase was completed in 1884; and the property was then developed by Messrs. Tubbs and Lewis at a distance of 1½ miles from New Romney. Railway access was secured to the place; Messrs. Tubbs and Lewis contributing £5000 towards the railway extension. The new branch was opened in 1884. Roads were made and houses built, together with an hotel. Owing to the death of Mr. Lewis, the development went on slowly for a time. In 1886, Mr. Tubbs had arranged for a water supply, which at first was a small matter and was given free to the tenants on the estate. Eventually, it became necessary that better arrangements should be made for the water supply. Expensive machinery was put up, a water-tower erected, and a charge was made to the tenants. This supply continued good for a time; but two or three years ago, the sea-wall was damaged, and the fresh water got contaminated with sea water. Investigations were set on foot; and Mr. Tubbs found that there was an enormous reservoir of fresh water beneath the shingle beds, and he acquired from the Duke of Cleveland 2445 acres of shingle in order to have the command of the underlying water. Altogether on the Littlestone property Mr. Tubbs had expended £100,000. Inasmuch as he would have more water than would be required by Littlestone, he deposited the Bill now before the Committee, which would enable him to give a water supply to the whole of New Romney and Lydd and the three parishes already mentioned, as well as Littlestone. When he had done this, he discovered that at about the same time another Bill had been deposited, called the New Romney and Lydd Water-Works Bill. It contained an express provision that no powers were to be taken to supply Littlestone except by consent of the owners of the estate. As it was obvious that the two measures could not succeed, the matter was brought before the Corporation; and they gave their support to the present measure, for the reason that the supply proposed under it would be better, and the rates lower, than under the Romney Bill. The Romney Corporation had a small well, from which they said they could supply water; and they had applied to the Local Government Board for power to borrow in order to give a supply of water from this well, the water of which was in a very polluted condition. The capital asked for was £36,000, with £12,000 borrowing powers. The works proposed would consist of two wells, a service reservoir, and four acqueducts. The New Romney Corporation in their petition alleged that if the water were taken from the shingle beds, it would be found brackish, as at certain times was the water at present supplied at Littlestone. They alleged, moreover, that there was nothing in the Bill to require the promoters to complete the works before the expiration of five years. As to the character of the water it was proposed to supply, the promoters had had an analysis made, which showed that it was perfectly good and potable; and in regard to the period of construction, they would be prepared to carry out the works as the Committee thought fit. They would if necessary complete the works in two years. There was a Local Government Board report which threw doubt on the quality of the water, and said that it was a question as to whether a supply should not be sought inland.

Mr. *H. T. Tubbs* and other witnesses gave evidence in support of the opening statement of Counsel. They contended that the scheme proposed was a *bonâ fide* one, that the water was of a good quality, and that the undertaking could only be successful if the whole of the districts mentioned in the Bill were included. If New Romney were struck out, the scheme would be impracticable; while it would not be possible for the district to supply itself.

Mr. WEDDERBURN, for the petitioners, considered it unnecessary to call evidence; but argued against allowing the promoters a period of five years for the completion of the works.

In the result, the Committee passed the preamble, but required the promoters to complete the works within two years, instead of five, as provided in the Bill.

HOUSE OF LORDS COMMITTEE.

(*Before the Earl of* CREWE, *Chairman, the Earl of* STAMFORD, *Lord* HYLTON, *Lord* CAREW, and *Lord* ROMILLY.)

GOSPORT WATER BILL.

The objects of this Bill, which came before the above Committee on Tuesday, the 15th inst., and succeeding days, were to authorize the Gosport Water-Works Company to construct additional works, to enable them to acquire the undertaking of the Lee-on-the-Solent Water-Works Company, to raise additional capital, to confer further powers, and for other purposes.

Mr. CLAUDE BAGGALLAY, K.C., and Mr. F. W. PEMBER appeared for the promoters. The petitioners against the Bill were represented by Mr. VESEY KNOX for the Fareham Urban District Council, Mr. RAM, K.C., for the Droxford Urban District Council, and certain landowners by Mr. SHAW.

Mr. BAGGALLAY, in opening, said the Company was incorporated in 1858, and acquired further capital by Acts of 1872, 1883, and 1897, under which they had raised, by way of share capital and premiums, £73,486 odd, and by way of debenture and debenture stock a little over £18,000—making the total capital employed in the undertaking, in round figures, £91,500. The Company had now only £700 of unissued capital—a very narrow margin. Its limits of supply included the whole of the parish of Alverstoke, in which were the prosperous towns of Gosport, Forton, and Anglesey, and a portion of the parish of Rownen. The population in the existing limits of supply was, in 1901, 28,884; and at the present time, 30,000. Gosport, being next to Portsmouth, had a very considerable number of naval and military establishments in it. The original source of supply of the Company was at Bury, where water was obtained from the Bagshot Sands; the maximum amount thus obtained being 340,000 gallons a day. In 1893, a further source became urgently necessary. Mr. Whitaker, who had an extended knowledge of the geological formations of the South of England, was consulted, and the result of an examination made by him showed that the nearest available place within the district from which an additional supply could be got by the Company was at Foxbury. A well was sunk there into the chalk formation, and a considerable yield of water obtained, which proved sufficient to meet the Company's needs until recently. But owing to the growing demand for water, and perhaps also to the dry seasons previous to last year, the

pumping put a strain on the source, and the water came up affected with chlorine. There were complaints from the public and the Admiralty, who took a considerable quantity of water for ships and Government purposes. The Company tried to prevent the infiltration of salt water, and again consulted Mr. Whitaker, and also Mr. Hawkins, another well-known geologist, and they were advised that it would be necessary to go outside the limits of their supply to obtain water—to go further to the north in the chalk between Bishops Waltham and Soberton. Two spots were selected as suitable; and by the original Bill, it was proposed to sink two wells there. The Company, however, after consideration and careful examination, had come to the conclusion that, for their present district, and the area they felt they ought to include in their limits of supply, an ample amount of water could be obtained from one well only—the Soberton well They thought it right to include within their limits of supply certain parishes through which the main from the new source of supply would pass, and which were at present without a water supply; and in going to the new source for water, it would be economical and necessary to abandon the existing source at Bury Cross and Foxbury. The water from the new source had been analyzed by Dr. Thresh, with satisfactory results. The new well was sunk in the chalk, which was capped by 50 feet of impermeable clay; and it would be lined so that any chance of pollution from the surface water or from the River Meon would be absolutely prevented. The Company felt so satisfied that they would do no injury, that they proposed to take upon themselves the liability to make good either in water or money compensation any injury to wells within a mile radius of the new source of supply. They took this responsibility also in regard to the River Meon. In another part of the Bill, they proposed to acquire, by consent on arbitration terms, the undertaking of the Lee-on-the-Solent Water Company. Lee was a growing place, but the water which the Company would get would amply suffice for its supply. The Bill originally asked for £80,000 capital powers; but they now asked only £56,000 (in consequence of the abandonment of one of the sites for a well) with borrowing powers of £14,000—making a total new capital of £70,000. The Droxford Urban District Council opposed the Bill on the ground that the primary duty of the Company was to supply water in Gosport, which was in a different watershed to the proposed source of supply; but it was quite common to take water from one watershed to another in the interests of economy and efficiency of supply.

Mr. *Thomas Hildred*, the Engineer and Secretary to the Company, said he was responsible for the scheme before the Committee. His Company supplied water for the Government to eight forts, a military hospital and prison, the Royal Marine and Rifle Barracks, and the Royal Clarence Victualling Yard. Up to 1902, they also supplied water to a large number of His Majesty's ships when in harbour. This they lost owing to the unfortunate affair of the chlorides in the water. The Government consumption in 1902 represented 24 per cent. of the Company's total revenue. The Company's authorized capital was £92,250, including £18,250 of debentures. They had raised capital, including £10,000 premiums, to the amount of £73,486. Their nominal capital was £63,500, and their unexhausted capital powers £700. From 1883 to 1891, maximum dividends were paid on all stocks—10 per cent. on the consolidated ordinary stock, 7 per cent. on the new ordinary, and 4½ per cent. on the preference shares. In December, 1902, the dividends were reduced to 7½ per cent. on the consolidated, and 5½ per cent. on the new ordinary; and in December, 1903, there was a still further reduction to 5 and 3½ per cent. respectively. The contamination of the Company's source of supply, and the consequent lessened output and loss of Navy consumption, were the sole reasons for this diminution of profit. The total net profits for 1902 were just under £5200. They proposed to raise under the Bill £56,000 in share capital —£40,000 by preference stock, and £16,000 by ordinary stock—and £14,000 by debentures. The ordinary capital of the Company would then be represented by £130,000 of share capital and £32,000 of debentures. Without any recognition of future increase of custom, and on the basis of the profits of 1902, they would be able to pay dividends on all their capital, including the new. There would be a decrease of working expenses, because they would have one instead of two pumping stations, and because the cost of cartage would be less owing to the works being situated next the Meon Valley Railway. Allowing for an increase of consumers and the added area, he considered the proposed site at Soberton suitable for obtaining the whole of their supply. They were creating no precedent in going into another watershed. The total quantity of water to be provided for in the next twenty years was 1315 million gallons.

Mr. *G. R. Strachan* said he had visited the Soberton site, and was quite sure the Company would get there all the water they needed for the population they were contemplating supplying. The bore was carried down to a depth of 171 feet. There were 51 feet of top clays, and then the chalk was struck. The principal source of water was 130 feet down, they next tapped water at 150 feet, and then every 7 or 8 feet to the bottom. This showed quite clearly that there was an underground flow at a great depth, from which the water supply would be obtained. He had no doubt of the purity of the water; and he did not believe the taking it would affect anyone.

Mr. *W. Matthews* gave corroborative evidence, and said the selected site was a good one. The loss of a year in getting water would be a very serious matter to the Company. The works proposed were ample, and the estimates sufficient. There was no possibility of the water being polluted by a flood on the River Meon, as there was a difference of level of 18 feet. He was certain the zone of depression caused by the pumping at Soberton of 1½ million gallons daily would not extend to anything like a mile radius.

Mr. *Whitaker* also gave evidence as to the suitability of the site selected at Soberton for obtaining a large supply of water.

A number of local witnesses for and against the Bill having given evidence, and Counsel having been heard,

The Committee decided to allow the Bill to proceed, subject to the extension of the area of compensation, either by water or money, to one-and-a-half miles. Later in the week, the clauses of the Bill were gone through, and adjusted in accordance with the decision of the Committee; and the Bill was ordered for report.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—KING'S BENCH DIVISION

Monday, March 14.

(*Before Mr. Justice* RIDLEY.)

Grand Junction Water-Works Company v. Benn.

This was an action to recover damages for wrongful use of water, or, in the alternative, payment as on implied contract.

Mr. ACLAND, K.C., and Mr. BARTLEY appeared for the plaintiffs; Mr. BARRETT represented the defendant.

Mr. ACLAND said the facts of the case were extremely simple. On March 21, 1890, Mr. Benn, who kept the Plough Inn, at Little Ealing, entered into an agreement with the Company for a supply of water for stable purposes at a yearly rent of £3 4s., and undertook that the water should not be used upon the premises. In 1902, the Company discovered that, without any communication being made to them, a connection had been effected, by means of which water had been taken and used for domestic purposes in the public-house, as well as for trade purposes, for two water-closets, and an automatic flushing arrangement for a urinal in the yard. As the water so used had not been paid for, the Company brought this action, either for trespass or for an implied contract to pay for the water used. Section 18 of the Water-Works Clauses Act, 1863, provided that if a person having a supply of water for other than domestic purposes used it for any purpose other than that for which he was entitled to use it, he should be liable for each offence to a penalty of 40s., without prejudice to the right of the suppliers to recover the value of the water so misused. So that the question really resolved itself into one of damages or for payment for the water. The damages he suggested the Company were entitled to recover were the payments they would have received supposing the water had been supplied in the ordinary way—that is to say, a percentage, in the first instance, upon the value of the house. The rateable value had been put at £100; but he was willing to take the sum named by the defendant—viz., £50. The automatic flushing tank was erected in 1902; and as there was no statutory charge for water so supplied, he suggested that it should be £3 3s. per annum, seeing that 180 gallons were used every day. He also claimed 6s. a year for the two closets. Mr. Benn died in 1898; and the action was brought against the widow, who was appointed executrix, and who had continued the occupation of the premises. The defendant pleaded the Statute of Limitations; and as the Company did not allege fraud, this was a good defence to part of the claim. The amount demanded—viz., £66—would therefore be reduced to £26 9s.

His LORDSHIP asked what was the answer.

Mr. BARRETT said he should contend, first, that the charge was excessive; and, secondly, that notice having been given to a servant of the Company, plaintiffs had been informed that water was being consumed for other than stable purposes, and in consequence of *lâches* they could not now recover.

His LORDSHIP said the defence seemed to be wanting in merits. Defendant had had the water, and would not pay for it.

Mr. BARRETT said he was willing to pay any reasonable sum the Court might fix.

Mr. ACLAND pointed out that, in the answer to interrogatories, defendant said she had not given the Company notice of the connection made for a domestic supply.

Mr. BARRETT said Mrs. Benn knew nothing of the connection having been made.

Evidence having been given as to the reasonableness of the plaintiffs' charge,

Mr. BARRETT said he must admit that the agreement was signed by Mr. Benn, and there was no doubt the connection between the stable and the house was made in his lifetime, though Mrs. Benn was not aware of it. From February, 1898, in the ordinary course, demand was made half yearly for £1 12s., for the water supplied; and this amount was paid. No inspection of the fittings was made by the Company; so that they were debarred by their own *lâches* from recovering for water consumed in ignorance. As a matter of fact, notice of the alteration was given to the waste inspector of the Company.

His LORDSHIP ruled that such a notice was not a notice given to the Company.

Mr. BARRETT further contended that the charge for water for the flushing-tank was excessive.

His LORDSHIP held that there had been no *lâches* on the Company's part, and that the connection had been made without their consent. He gave judgment for them for £26 9s., with costs.

Pwllheli Public Lighting.—As the result of a conference with a Joint Committee of the Town Council, the Pwllheli Gas Company have agreed to reduce the charge for gas for public lighting to 4s. per 1000 cubic feet; but they decline at present to lower the price to private consumers. It has, however, been resolved that the matter shall be gone into again in April next year, when the Company will be in a position to see the results of alterations and improvements now in progress.

Public Lighting in Westminster.—At the meeting of the West minster City Council on Thursday, a letter was received from the Office of Works stating that there are no funds available to improve the lighting of the globular lamps in Parliament Square, by substituting incandescent burners for the existing flat-flames. It was possible, however, that something might be done in the matter next year. An offer from the Gaslight and Coke Company to take over the remaining lamps of the gas installation in St. George's district upon the usual terms was accepted.

MISCELLANEOUS NEWS.

ALLIANCE AND DUBLIN GAS COMPANY.

Half-Yearly Report and Accounts.

The report to be presented at the half-yearly general meeting of the above-named Company on Thursday shows that the gross receipts for the six months ended the 31st of December amount to £162,371 11s. 4d., and the expenditure (including £6043 2s. 11d. interest on debenture loan, &c.) to £127,264 15s. 3d.; showing a net profit of £35,106 16s. 1d., to which is to be added £10,015 18s. 4d., carried forward—making a total of £45,122 14s. 5d. The Directors recommend the payment of the usual dividends at the rate of 10½ per cent. per annum on the shares created under the Company's Act of 1866, and 7½ per cent. per annum on those issued under the Acts of 1874 and 1883. The payment of these dividends will absorb £35,280 6s. 3d.; leaving a balance of £9842 8s. 2d. to be carried forward. The accounts accompanying the report show that the total revenue comprised £110,737 received for 710,936,000 cubic feet of gas sold to ordinary consumers, £8314 for gas used for public lighting and supplied under contracts, £3512 for the rental of meters, £16,019 for coin-meter supplies, and £23,416 for residual products. The expenditure during the half year included £30,959 for coal, £20,085 for cannel and oil (the total cost of manufacture being £76,178), £23,094 for distribution, £9052 for rates and taxes, and £5522 for management. The carbonization of 44,686 tons of coal and 1452 tons of cannel, together with 1,276,675 gallons of oil, produced 837,976,000 cubic feet of gas, of which 762,770,000 cubic feet were sold and 771,337,000 cubic feet accounted for. At the close of their report, the Directors refer to the fact that during the half year covered by it the gas was supplied at a reduction of 3d. per 1000 cubic feet, compared with the corresponding period of 1902; and thereby the consumers benefited to the extent of more than £8000. A further reduction of 2d. per 1000 cubic feet has been in operation since Jan. 1.

GERMAN CONTINENTAL GAS COMPANY.

Annual Report and Accounts.

We are indebted to Herr W. von Oechelhaeuser, the General Manager of the German Continental Gas Company, for a copy of the annual report and statement of accounts as submitted to the proprietors at the forty-ninth annual general meeting of the Company on the 25th inst. From these documents our customary summary of the past year's progress of the Company has been prepared.

The net result of the Company's business during the year 1903 was very good. The improvement in industry generally which gradually set in towards the close of 1902 was maintained throughout the past year; and the gas industry participated in it. The make of gas at the nineteen works owned by the Company showed, as a whole, an increase of 7·78 per cent. on that of the preceding year, which, in its turn, had afforded an increase of 4·85 per cent. The absolute increase in output in 1903 was greater than in any previous year since the Company commenced operations in 1856. The total make of gas for the year amounted to 68 490,233 cubic metres (2,418,842,163 cubic feet), of which 72·74 per cent. was consumed for lighting, and 22·53 per cent. for heating and power purposes, the remaining 4·73 per cent. being unaccounted for. The Company consumed 0·86 per cent. of the total output for their own use. The consumption for heating and power purposes advanced at the rate of 10·47 per cent., and that for lighting at only 5·81 per cent., compared with the corresponding figures for 1902. The profit for the year amounted to 3,234,563·97 marks (about £157,783), which was a gain of 371,986·99 marks (about £18,145) over that for the preceding year. It was recommended that out of the profit 1,200,000 marks—as compared with 900,000 marks in 1902—be set aside as a contribution to the renewal fund, and that a dividend at the rate of 10 per cent. for the year be declared. This was the same rate as for 1902; but besides the increased contribution to the renewal fund, the balance carried forward (81,269·63 marks—about £3964) showed a substantial increase.

With regard to bye-products, there was a considerable falling off in the amount obtained for coke, though the price paid for coal did not appreciably decline. Tar fetched about the same price as in 1902; while for ammonia improved prices were maintained. Cyanogen products continued depressed.

There was a substantial advance in the amount of gas sold through slot meters; and every endeavour is being made to cultivate this branch of the Company's business. The last two years have also witnessed a considerable extension of the supply of gas fires and cookers on the hire system, which trade had previously not progressed so rapidly as is general among English and French gas companies. The amount of gas supplied to gas-engines increased by 2·97 per cent., notwithstanding a vigorous agitation in favour of suction gas-producers for the production of power gas as it is required for consumption in the gas-engines. Only 11 out of the 1093 gas-engines supplied by the Company on Jan. 1, 1903, were converted in the course of the year for the consumption of power gas from suction producers. The Company experimented on a large scale with this type of producer in connection with the gas-engines at their central workshops and their electrical station at Dessau; and an economy in the consumption of fuel was attained thereby. Nevertheless, it is apparent that the advantages of a supply of coal gas for gas-engines often outweigh the economy of fuel obtainable by means of suction gas-producers; and coal gas will still compete successfully with them. Further, the Company are continuing, notwithstanding the many "poor" fuel gas schemes advanced in Germany and

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 827.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest. £ s. d.
£			p.c.	GAS COMPANIES.			
590,000	10	Oct. 15	10½	Alliance & Dublin 10 p.c.	19½–20½	..	5 2 5
100,000	10	,,	7½	Do. 7 p.c.	13–14	..	5 7 2
200,000	5	Nov. 12	6½	Bombay, Ltd.	5⅛–6	..	5 8 4
140,000	5	,,	6½	Do. New, £4 paid	4–4½	..	5 15 7
380,000	Stk.	Feb. 25	12	Brentford Consolidated	222–227	..	5 5 9
300,000	,,	,,	9	Do. New	167–172	..	5 4 8
50,000	,,	,,	5	Do. 5 p.c. Pret.	127–132	..	3 15 9
206,250	,,	Dec. 11	4	Do. 4 p.c. Deb.	103–108	..	3 14 1
220,000	Stk.	Mar. 10	10⅝	Brighton & Hove Orig.	202–207*	..	5 3 10
246,320	,,	,,	7⅛	Do. A. Ord. Stk.	142–147*	..	5 5 5
460,000	20	Oct. 15	10	British	38–39	..	5 2 7
100,000	Stk.	Feb. 25	6	Bromley, Ord. 5 p.c.	112–117	..	5 2 7
165,700	,,	,,	4½	Do. do. 3½ p.c.	85–90	..	5 0 0
500,000	10	Oct. 15	7	Buenos Ayres (New) Ltd	10⅛–11	+⅛	6 7 3
250,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	91–93	..	4 6 0
150,000	20	Mar. 10	8½	Cagliari, Ltd.	21–23*	..	7 3 6
100,000	10	June 11	10	Cape Town & Dis., Ltd.	14–15	..	6 13 4
50,000	50	Nov. 3	6	Do. 6 p.c. 1st Mort.	52–54	..	5 11 1
1,375,000	Stk.	Feb. 25	5⅝	Commercial 4 p.c. Stk.	102–107	..	4 17 3
536,485	,,	,,	5	Do. 3½ p.c. do.	97–100	..	5 0 0
442,947	,,	Dec. 11	3	Do. 3 p.c. Deb. do.	84–87	..	3 9 0
800,000	Stk.	Dec. 30	7	Continental Union, Ltd.	103–108	..	6 9 8
200,000	,,	,,	7	Do. 7 p.c. Pref.	130–135	..	5 3 8
575,000	Stk.	Feb. 25	5½	Crystal Palace Ord. 5 p.c.	108–113	..	4 14 4
60,000	,,	,,	5	Do. 5 p.c. Pref.	115–120	..	4 3 4
112,533	,,	Jan. 14	5	Do. 5 p.c. Deb. Stk.	134–137	..	3 13 10
486,090	10	Jan. 28	10½	European, Ltd.	18–19	..	5 10 6
354,060	10	,,	10½	Do. £7 10s. paid	13–14	..	5 12 6
15,243,200	Stk.	Feb. 11	4⅛	Gas-light and Coke { 4 p.c. Ord.	87–89	..	4 18 10
2,600,000	,,	,,	3½	{ 3½ p.c. max.	88–90	..	3 17 9
3,799,735	,,	,,	4	{ 4 p.c. Con. Pref.	104–107	..	3 14 9
4,193,975	,,	Dec. 11	3	{ 3 p.c. Con. Deb.	85–87	..	3 9 0
258,740	Stk.	Mar. 10	5	Hastings & St. L. 3½ p.c.	88–93*	..	5 7 6
70,000	10	Oct. 15	11	Hongkong & China, Ltd.	16–17	..	6 9 5
3,800,000	Stk.	Nov. 12	10	Imperial Continental	192–195	..	5 2 7
473,600	Stk.	Feb. 11	3½	Do. 3½ p.c. Deb. Red.	97–99	..	3 10 8
165,242	Stk.	Mar. 10	6	Lea Bridge Ord. 5 p.c.	103–108*	..	5 11 1
561,000	Stk.	Feb. 25	10	Liverpool United A	208–210	+1	4 15 3
718,100	,,	,,	7	Do. do. B	158½–160½	..	4 7 3
306,083	,,	Dec. 30	4	Do. do. Deb. Stk.	108–110	..	3 12 9
75,000	5	Dec. 11	5	Malta & Medn., Ltd.	4¼–4⅝	..	5 5 3
560,000	100	Oct. 1	5	Met. of { 5 p.c. Deb.	101–105	..	4 15 3
250,000	100	,,	4½	Melbourne { 4½ p.c. Deb.	101–103	..	4 7 5
541,920	20	Nov. 12	3½	Monte Video, Ltd.	9–10	..	7 0 0
1,515,892	Stk.	Feb. 26	4½	Newc'tle & G'tesh'd Con.	106–107	−½	4 4 1
405,025	Stk.	Dec. 31	3½	Do. 3½ p.c. Deb.	93½–94½	..	3 14 1
300,000	Stk.	Nov. 26	8	Oriental, Ltd.	135–140	..	5 14 4
600,000	5	Sept. 30		Ottoman, Ltd.	5–6	..	5 16 8
					* Ex div.		

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Invest. £ s. d.
£			p.c.	GAS COMPANIES.			
205,005	Stk.	Jan. 14	6½	Ply'mth & St'house 5 p.c	121–126	..	4 17 2
851,070	10	Oct. 15	7	River Plate Ord.	11½–12	..	5 16 8
300,000	Stk.	Dec. 30	4	Do. 4 p.c. Deb.	92–94	..	4 5 1
250,000	10	Sept. 30	7†	San Paulo, Ltd.	10⅞–11⅛	..	6 1 9
135,000	Stk.	Mar. 10	10	Sheffield A	236–238*	..	4 4 0
209,984	,,	,,	10	Do. B	235–237*	..	4 4 5
523,498	,,	,,	10	Do. C	234–236*	..	4 4 9
116,106	Stk.	Sept. 30	5	Shrewsbury Ord. 5 p.c.	109–112	..	4 9 3
6,150,000	Stk.	Feb. 11	5⅜	South Met., 4 p.c. Ord.	116–119	+½	4 9 6
1,832,700	,,	Jan. 14	3	Do. 3 p.c. Deb.	85–88	..	3 8 2
380,940	Stk.	Nov. 12	5	Southampton Ord.	105–110	..	4 10 11
87,950	,,	Jan. 14	4	Do. 4 p.c. Deb.	100–103	..	3 17 8
120,000	Stk.	Feb. 25	6	Tottenham and Edmonton { A. 5 p.c.	112–117	..	5 2 7
313,020	,,	,,	4½	{ B. 3½ p.c.	93–98	..	4 11 10
182,380	10	Dec. 30	8	Tuscan, Ltd.	£⅛–9	..	8 17 10
149,900	10	Jan. 2	5	Do. 5 p.c. Deb. Red.	97–99	..	5 1 0
745,872	Stk.	Mar. 10	5	West Ham, 5 p.c. Ord.	94–97*	..	5 3 1
				WATER COMPANIES.			
781,517	Stk.	Dec. 30	12	Chelsea, Ord.	350–365	..	3 7 7
150,000	,,	,,	5	Do. 5 p.c. Pref.	142–147	..	3 8 0
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	132–137	..	3 5 8
175,785	,,	Sept. 30	4½	Do. 4½ p.c. Deb.	132–137	..	3 5 8
1,720,560	Stk.	Oct. 15	8	East London, Ord.	220–225	..	3 11 1
654,740	,,	Dec. 11	4½	Do. 4½ p.c. Deb.	133–138	..	3 5 3
1,524,288	,,	,,	3	Do. 3 p.c. Deb.	87–90	..	3 6 8
700,000	50	Dec. 11	10	Grand Junction { 10 p.c. max.	136–139	..	3 11 11
310,000	Stk.	Sept. 30	4	{ 4 p.c. Deb.	115–120	..	3 6 8
708,000	Stk.	Feb. 25	10	Kent	315–320	..	3 2 6
160,000	,,	,,	7	Do. New, 7 p.c. max.	217–222	+2	3 3 0
1,043,800	100	Dec. 30	11	Lambeth, 10 p.c. max.	312–317	..	3 9 5
406,200	100	,,	8½	Do. 7½ p.c. max.	228–233	+1	3 13 0
350,000	Stk.	Sept. 30	4	Do. 4 p.c. Deb.	115–120	..	3 6 8
500,000	100	∂Feb. 25	10	New River, New Shares	365–375	−10	2 13 4
1,000,000	Stk.	Jan. 28	4	Do. 4 p.c. Deb.	116–119	..	3 7 3
902,300	Stk.	Dec. 30	7½	South-wark and { Ord.	273–278	−1	2 14 0
126,500	100	,,	7½	{ 7½ p.c. max.	215–225	..	3 6 8
489,200	Stk.	,,	5	{ 5 p.c. Pref.	144–149	..	3 7 1
1,019,585	,,	Oct. 15	4	Vauxhall { 4 p.c. A Deb.	115–120	..	3 6 8
1,155,066	Stk.	Dec. 11	10	West Middlesex	292–297	..	3 7 4
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	130–135	..	3 6 8
200,000	,,	Mar. 10	3	Do. 3 p.c. Deb.	87–90*	..	3 6 8
					* Ex div.		

† Next Dividend will be at this rate.

other countries, to believe that only a relatively "rich" gas, such as coal gas, will pay for distribution from central stations. Coal gas, indeed, occupies the exceptionally favourable midway position between the "poor" fuel gases and the very rich gases, such as oil gas and acetylene, which offer no advantages over coal gas either for incandescent lighting or heating.

The community of Eiche has during the year been added to the six outlying places already supplied from Potsdam, and a small new works, managed from Potsdam, has now been built for the direct supply of the three communities of Eiche, Bornim, and Bornstedt. A concession has also been secured for the supply of gas for thirty years to Tzschetzschnow, near Frankfort-on-Oder. The concession for a portion of a district supplied from the Company's works at M.Gladbach was yielded up on Jan. 1 last to the Local Authority for a cash payment, and the Company are now supplying only the adjoining communities of Rheydt Odenkirchen, Wickrath, and Rheindahlen from their M.Gladbach works. The Russo-Japanese War may possibly lead to the great increase of consumption in 1903 from the Company's works at Warsaw not being maintained in the current year; but having regard to the resources of Russia, no further injury need be feared.

A new and more reliable mode of determining the number of burners supplied was adopted in the past year, with the result that there appeared to be an unusually large increase for the year. Consequently, there was shown an apparent falling off in the consumption of gas per burner, which worked out at 72·2 cubic metres (2550 cubic feet) in 1903. The make of gas per ton of coal carbonized rose from 10,787 cubic feet in 1902 to 11,002 cubic feet. The coke consumed for firing the retort-furnaces amounts to 17·78 per cent. of the weight of coal carbonized. The length of street-mains was considerably extended during the year, and at the close reached a total of 650 miles.

The report contains an obituary notice of Herr J. Ossent, who died on March 16, 1903. He had been connected with the Company for over 45 years, and since 1874 had sat on the Board of Control.

GAS AFFAIRS AT TORQUAY.

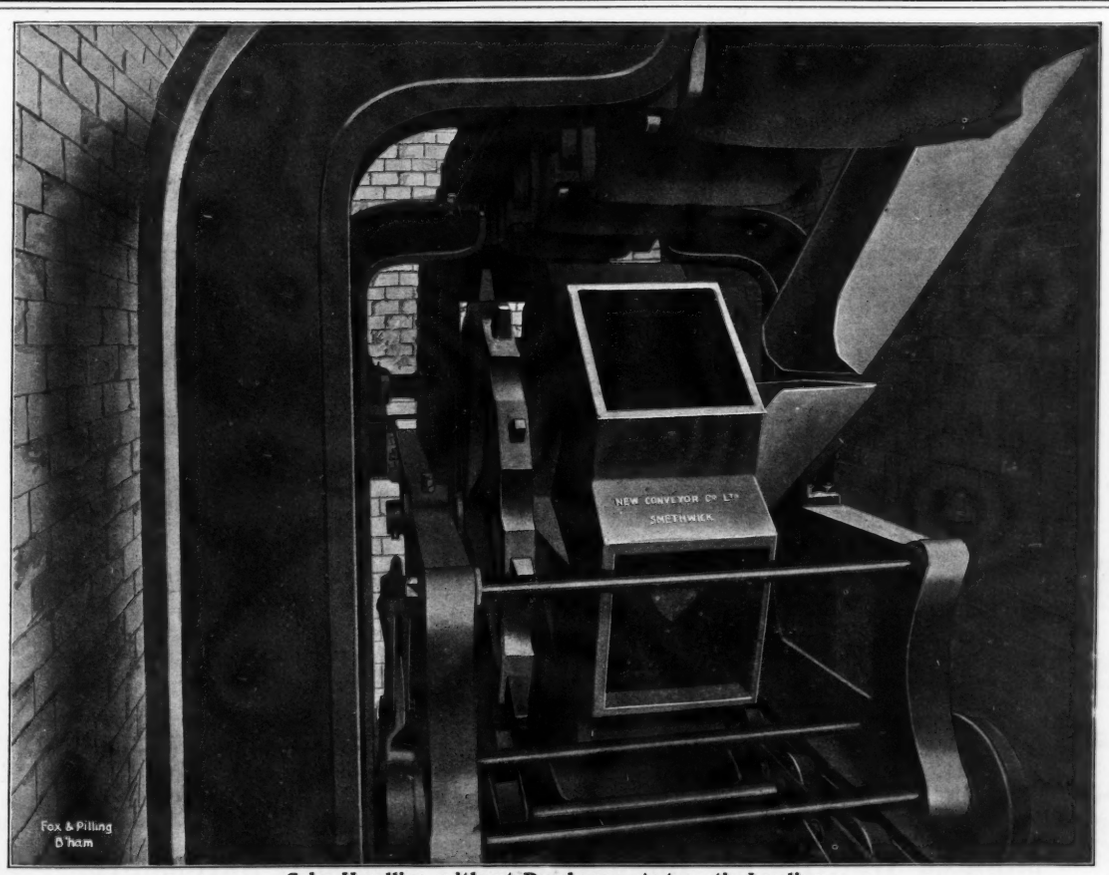
Progress of the Gas Company—The Electrolysis Question.

It was not to be expected that the success of the Torquay Gas Company before the Committee of the House of Commons on the Torquay Tramways Bill, as reported last week (p. 782), would pass without mention at the annual meeting of the Company last Tuesday. It was introduced by the Chairman (Mr. W. H. Kitson) reading a letter from Mr. A. Iredale, one of the Directors, congratulating the shareholders on the outcome of the Directors' efforts to protect the Company's property against the loss which might be caused by the introduction of electric tramways. He added that it was a positive injustice that a gas company should be put to great expense in defending their interest against an outside Company which threatened to endanger them. With regard to the general working of the Company, the report presented set forth that the price of gas was reduced from 3s. 3d. to 3s. per 1000 cubic feet at Christmas last, and that there had been a considerable increase in the sales. The receipts on revenue account last year amounted to £33,872, and the expenditure to £26,549; leaving a profit balance of £7323, out of which payment of the full dividends of 10 and 7 per cent. was recommended. In moving the adoption of the report, the Chairman said the receipts were £1156 more, and the expenditure was £1100 more than in 1902. The increased sale of gas was remarkable when they considered the competition surrounding them. They found, however, that they had nothing to fear from the electric light. In the seven years prior to its introduction, the total revenue from sales of gas amounted to £132,908; while in the seven years since its establishment they had received £151,018. The business had developed considerably by the extended use of cooking-stoves; and the sales of these and gas-fires proved greater in the past winter than at any previous time. The prepayment meter business was also extending; and at the end of 1903 there were 1658 of these meters in use. The reduction in the price of gas to 3s. per 1000 cubic feet meant a saving of £1750 to the consumers. As to the tramways, had it not been that the Gas Company had a very strong case, ably presented by Counsel, they would not have gained the protective clause granted by the Committee. Mr. C. N. Luxmore thought the Town Council had not acted in this matter fairly by the Company. The Corporation sought protection for the mains of their own gas-works at St. Mary Church, and it would have been more courteous if they had provided at the same time for the protection of the Torquay mains, seeing that the Company were such very large ratepayers. Whether or not the electric tramways caused damage to the mains, they would be a source of expense by increasing the difference of getting at the pipes for repairs. The report was adopted.

THE MARYLEBONE ELECTRIC LIGHTING QUESTION.

The London County Council to Advance the Purchase-Money.

At the Meeting of the London County Council last Tuesday, the Finance Committee presented the report on the above subject given in the "JOURNAL" last week, and recommended: (1) That, subject to amendments satisfactory to the Council being made in the St. Marylebone Electric Lighting Bill, 1904, provision be made in the Council's Money Bill of 1904 to enable it, in the event of the St. Marylebone Metropolitan Borough Council being empowered to borrow in the session of 1904, to lend to the Borough Council the sum of £1,365,000; that, to enable the loan to be advanced temporarily, power be sought in the Money Bill to enable the Council to issue London County Bills to an amount not exceeding £1,500,000, in addition to the £2,000,000



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of bills required for the Council's own purposes; and that the Council do agree to raise such sum by the issue of stock, and to lend the same to the Borough Council in replacement of the temporary loan, so soon as the financial conditions are sufficiently favourable—such time being determined, if necessary, on the advice of the Governor of the Bank of England. (2) That the terms of the above resolution be communicated to the Council of the Metropolitan Borough of St. Marylebone, with an intimation that, should it agree to the terms thereof, the Council will be prepared, on the necessary powers being conferred by the passing of the London County Council Money Bill, 1904, and the St. Marylebone Electric Lighting Bill, 1904, to advance to it the loan of £1,365,000 on terms to be arranged subsequently." The recommendations were unanimously adopted.

ELECTRIC LIGHTING QUESTION AT CAERPHILLY.

Board of Trade Inquiry.

The Caerphilly Urban District Council are again this year applying for a Provisional Order to enable them to supply electricity to four centres of population in their district—viz., Caerphilly, Llanbradach, Aber, and Senghenydd. Last year, an Order applied for by the Council for a similar purpose was, it may be remembered, strongly opposed, and failed to secure the approval of the Board of Trade. An inquiry into the present application was conducted last Wednesday, at the Cardiff Town Hall, by the Hon. T. H. W. Pelham, one of the Assistant Secretaries of the Board. Mr. Seymour Bushe, K.C., appeared on behalf of the promoters. The several opponents were represented by Mr. Noble, for the Taff Vale and Rhymney Railway Companies; Mr. Rhys Williams, for the Barry Railway Company and the Windsor Coal Company; Mr. Kelly, for the Rhymney and Aber Valleys Gas and Water Company; Mr. Saunders, for the Great Western Railway Company; Mr. Hugh Ingledew, for the Cardiff Coal Company (Llanbradach Colliery); and Mr. E. B. Reece, for Lord Windsor. For the promoters it was shown by their Engineer (Mr. A. H. Preece) and others that since last year there had been a great increase in the number of houses in the district; that the proposal to provide a generating station had been abandoned; and that an agreement had been entered into between the Council and the South Wales Electrical Power Company to supply electricity in bulk at three specified points within the district, at a price of 1½d. per unit for a minimum supply of 50,000 units per annum. The Order, it was stated, was supported by the unanimous resolution of the Council, of public meetings held throughout the district, of Chambers of Trade, and of Ratepayers' Associations. The chief witness for the opposition was Mr. R. Hammond; and it was urged in support of it that the scheme could not be commercially successful; that outside the Railway and Colliery Companies, who would make their own arrangements for power and light, the great bulk of possible consumers would be colliers.

EAST LONDON WATER-WORKS COMPANY.

The Half-Yearly General Assembly of Proprietors was held on Thursday, at the Company's Offices, St. Helen's Place, E.C.—the Chairman, Colonel A. R. M. Lockwood, M.P., presiding.

The Secretary (Mr. I. A. Crookenden) read the notice calling the meeting; and the Directors' report and the accounts were taken as read.

The Chairman said that he need not detain the proprietors long as to the details which the accounts presented. The figures had been verified and certified as being correct by the Government Auditor, as also by the Company's own Auditors. The latter made special reference to certain assets which, upon the conclusion of the current half year, June 24 next, should be, in their opinion, taken into account in the Company's favour. These points would, of course, be borne in mind in arriving at the final balance-sheet. The revenue account for the past half year showed a considerable reduction in expenditure under the heading "maintenance." This arose principally from the fact that the Company had to purchase no water from other Companies, and so saved relatively a sum of £24,615. Nearly all the other items under this heading were less in amount than for the corresponding period of 1902—making the outlay smaller by £27,000. The item of "management" was also slightly less. On the income side of the account, the increase in water-rates was a very moderate sum —£191 only. This arose from two causes. First, that they had an abnormal number of houses empty, certain districts on the eastern border having been considerably overbuilt; and, secondly, the great stagnation in trade and other causes had materially affected the income from the meter supplies. A revival would, no doubt, set in, and their successors would reap the advantage of the normal increase in past years, which, as a rule, varied from £6000 to £7000 a year from this source. Similarly, the houses which were now empty would, in all probability, be occupied and add to the income derived from fixed rates. There was no other point, he thought, that he need trouble them with upon matters of detail. He would, therefore, pass to the question of the arbitration and its results, which would, perhaps, be more interesting to them than the present state of affairs. As stated in the report, the Company were before the Arbitrators for thirteen days. The award, assuming the Arbitrators to be correct in their judgment that the Company must be debited with the amount of the sinking fund, placed the value of the undertaking—*i.e.*, the ordinary stock—at £3,900,000. If the Arbitrators were wrong in their judgment, and the Company were not to be valued as subject to the sinking fund, then the amount of the award would be £4,300,000. In the first event, the award worked out at 226 per cent., and in the second at 250 per cent. The Companies proposed to take this point to the House of Lords for their decision. In any case, either of these figures must be subject to some deductions by reason of the expenses that would necessarily be incurred. For instance, the

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cost of the arbitration had been taxed; and the Taxing Master had, as was almost universally the case, declined to allow the whole of the expenses incurred by the Company. Counsel's fees were placed at a very high figure, but no higher than, if so high as, those allowed to Counsel acting for the Water Board; and the Company had, of course, to retain the services of gentlemen of the highest rank in the profession. The same thing might be said with regard to the expert witnesses—the Engineers, Accountants, and so on; but the Directors were convinced that the greatest care had been observed in this expenditure, although there were many items which were really beyond their control. The Solicitors and chief officers of the Company worked with energy and devotion and skill beyond all praise; and the thanks of the shareholders were, indeed, due to them. The unjustifiable attacks upon the Company's sources of supply that had, in the past, formed such a leading feature of their opponents' programme, utterly failed, and the Company came out "more than conquerors;" the observations of the President, immediately before announcing the award, completely disposing of the reckless accusations made, especially against the character and condition of the River Lea. It was difficult to describe the intricacies and subtleties of the application of the unparalleled impositions which the Company had to bear by reason of the sinking fund and what were known as the sterilization clauses of recent legislation. But despite these burdens, the Directors were of opinion, and were still convinced, that if left alone—after having passed through such a trying period, which, in the nature of things, would not have recurred, with the recent enormous storage capacity, and the wells and machinery being brought into maximum use—the Company would, in time, have realized the 10 per cent. dividend, and even more. The Directors, therefore, regretted the announcement of the President, in giving the award, that the limit of 10 per cent. was not likely to have been reached by the Company. The Directors felt that a visit of the Court of Arbitration to the works and reservoirs would have revealed, by ocular demonstration, the splendid character of the machinery, filtration beds, and apparatus, and the enormous storage reservoirs, and have ensured a more generous and a broader estimate of the future capabilities for development and profit which the Company possessed. The award, however, was final, and, subject to the decision of the House of Lords, they must accept it with the best grace they could. As stated in the report, the scheme for the distribution of the net amount available would be prepared and circulated among the proprietors as soon as practicable after the decision of the House of Lords had been given. The proprietors would remember that the condition was that the purchase money should be paid to the Company in cash; but, by agreement with the Water Board, it might be discharged wholly or partly in water stock. As to this alternative, the Water Board had not up to the present made any overtures to them. If they should do so, the Directors would then consider the matter. The business of the Company was going on, and would continue to do so, just as heretofore, up to June 24, on which day the undertaking would be transferred to and vested in the Water Board. There was one solace, perhaps, which he might mention—quite accidental, it was true, but nevertheless existing, and it should be borne in mind—namely, that some of the best securities were now at a very low price, and that the present was a favourable opportunity for shareholders to secure high-class and safe investments for the cash which they were to receive. He might further remind them that the compensation was to be paid within six months of the "appointed day,"—namely, June 24 next. They would meet again at the usual time in October, or earlier if they could, when the balance-sheet would be presented, and the dividends and profits up to Midsummer would be paid as usual. From Midsummer to the date on which they received the compensation money from the Water Board for their respective holdings, that body would pay interest at the rate which the Company would have paid in dividends had they been going on in the usual way. He concluded by moving the adoption of the report and accounts, and the payment of a dividend at the rate of 8 per cent. per annum, less income-tax, on the ordinary stock, for the half year ended Christmas, 1903, payable on the 14th prox.

Mr. GEORGE BANBURY seconded the motion.

Mr. NEWBY said that though the proprietors might not feel satisfied with the price which the Board had secured for the Company's undertaking, he felt certain that nothing had been wanting on their part to get the best terms possible in the circumstances. A great injustice was being done to all the Water Companies. (Hear, hear.) The proprietors had been led to invest their money under an Act of Parliament; and they did not expect that the Legislature would take advantage of their power to sacrifice the interests of those concerned. Under the Act of Parliament, the holders of the 4½ per cent. debenture stock were paid their interest free of income-tax by the Company; and he wished to know whether any provision had been made for the Water Board to do the same?

Mr. ILSLEY inquired whether the proprietors would be consulted as to their receiving the award in cash or in stock?

The SOLICITOR (Mr. Bonnor-Maurice) said that, under the fourth schedule of the Act, the Board had to prepare a scheme which would be sent round to the proprietors. The scheme would, no doubt, include a reference to their taking the sum to which they were entitled in stock or in cash; and the proprietors would have an opportunity of expressing their opinion upon it at a general meeting to be called if they were not satisfied with what the Board proposed.

Mr. BARTHROPP asked whether the "appointed day" was definitely fixed for June 24, or whether there was power to alter the day?

The CHAIRMAN said he took it that the Local Government Board, if not the Water Board, had power under the Act to postpone the "appointed day."

The SOLICITOR also observed that the "appointed day" might be postponed.

The CHAIRMAN, in reply to the discussion, said that nobody more deprecated the interference of Parliament in private undertakings

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than himself. He was afraid, however, that he could hardly say anything on the point that would satisfy Mr. Newby. It must not be forgotten that the Company were unwilling sellers. They had no wish to part with their property, which, the Board believed, had now entered upon a career of prosperity it had not enjoyed hitherto. The Water Board would have to pay income-tax on the 4½ per cent. debenture stock just as the Company had done. The present value of their land had, of course, been considered in fixing the amount of the award.

The resolution was then carried unanimously.

On the motion of Mr. Cuff, seconded by Mr. Ilsley, the Chairman, Sir Herbert Barnard and the Hon. A. E. Fellowes, M.P., were re-elected Directors; and, on the proposition of Mr. F. G. Lane, seconded by Mr. Newby, the retiring Auditor, Mr. Daniel Hill, F.C.A., was also re-elected.

A vote of thanks having been accorded to the Chairman and other Directors, and also to the officers of the Company, the proceedings terminated.

Accident at the Newcastle (Staffs.) Gas-Works.—An alarming accident, fortunately unattended by personal injuries, happened on Tuesday night at the Newcastle-under-Lyme Gas-Works. A new purifier-house was in course of erection, and when the workmen ceased for the day, the roof had been partially constructed, and some of the wrought-iron principals put up. About an hour after the men had left, the roof collapsed, bringing down the new walls—the accident being attributed to the high wind. One of the purifier-covers was broken, and the escaping gas took fire and burnt fiercely for some time, until the Newcastle Fire Brigade attended and extinguished the flames. There was no interruption of the gas supply to the town.

Bursting of a Water-Main at New Basford.—Owing to the subsidence of a portion of Haydn Road, Basford, consequent upon coal-mining operations, a section of 18-inch water-main succumbed to the strain on Wednesday evening, and burst about nine o'clock. The result was that the supply over the greater part of the area served by the main was cut off. On being informed of the occurrence, the General Superintendent of the Water Department (Mr. J. D. Thompson) took the necessary steps to repair the damage as quickly as possible. Workmen were engaged at the spot all through the night, in order to replace the length of main, which was one of the third largest in the entire system. The Haydn Road main has given the Water Department considerable trouble, for the Babbington miners are at work, if not directly under the roadway, at any rate in the immediate vicinity; and the gradual subsidence of the soil has on several occasions loosened the joints of the pipes, and necessitated constant attention and repair. The present breakage was due to a gentle fall of the roadway at each end of the burst section of the main, causing the pipe to assume a bowed shape, and to split in a zigzag, saw-tooth fashion from end to end on its upper surface.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

Business led me last Monday evening to be in Glenogle Road, in Edinburgh—one of the thoroughfares in which the Corporation have begun to "experiment" with the introduction of incandescent gas lighting. My opinion is that the system of lighting is a pronounced failure. The lanterns are those which the Corporation Lighting Committee, in their wisdom, preferred to order from abroad, at a penny each more than they would have paid for an up-to-date lantern which was offered by a local firm. The lantern they have selected is cylindrical, not globular, in shape; that of the local firm was square. It is the form and size of the lantern which, I am convinced, are its weakness. The diameter of it is so great, and the mass of the glass is so much, that the heat of the light is insufficient to carry over the dew point, with the result that moisture deposits upon the interior surface; and, of course, the passage of the light is impeded. As matter of fact, the light the new lamps were giving was not appreciably greater than was being obtained from flat-flame burners in the portion of the thoroughfare which has not yet been converted—if it is to be. Possibly in a drier climate they may work quite satisfactorily, or, if more than one burner were used, the heat might be sufficient to prevent the formation of moisture; but as they are being used, at some states of the temperature at all events, they do not give satisfaction. On the same evening, I had occasion to pass through the Middle Meadow Walk, where the Gas Commissioners several years ago fitted up lanterns of much narrower formation, for incandescent lighting; and they were altogether free from the drawback from which the Corporation lanterns suffer. I suppose the idea underlying the wide lantern is to give room for cleaning the interior; but in this instance the improvement has been overdone, and the system of lighting by incandescent gas is not receiving a trial which does it justice. It will not be surprising, therefore, if the movement should receive a check, and Edinburgh continue to be a bye-word and a reproach in the matter of public lighting, as it has too long been—unless means be taken to induce the Corporation to reconsider their decision as to the lantern to be employed.

The Edinburgh and Leith Gas Commissioners held their annual dinner last night, at which the only feature we are interested in was the first appearance of Bailie Bryson, of Leith, in public, in his new capacity of Convener of the Works Committee. He acknowledged the toast of "The Gas Commissioners," and in doing so said that, notwithstanding the spread of electric lighting, the consumption of gas was increasing at a phenomenal rate. When the Commissioners took over the gas undertakings in 1888, their first annual income was £320,000; last year it was £635,000. When electric light was introduced into Edinburgh, the customers of the Gas Commissioners numbered 63,000; last year they numbered 84,000. When they took over the gas undertakings, the price of gas was 3s. 6d. per 1000 cubic feet

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SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
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SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	125,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
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at which it remained for long, except in 1892-3, when, in consequence of dear coal, it was 4s. 6d. It is now 2s. 9d. This price provides for all interest and sinking fund charges upon the largely increased capital expenditure at Granton, no less than £438,000 having been expended upon the first portion of the works erected there. The Commissioners have decided to proceed with the erection of a second section of the works, at an estimated cost of £200,000, which will enable them, when completed, to entirely shut the Edinburgh works, and to concentrate their whole gas making industry at Granton. There was a time when it was thought that the competition of electric light would be a serious matter for the finances of gas undertakings; but experience, both in their own and in other towns, had proved that the electric light had acted as a stimulant rather than a drag upon the success of the gas industry of the country—the gas industry having increased its consumption of coal by no less than 50 per cent. during the last ten years. Mr. Herring, the Engineer, acknowledged the toast of "The Gas Commissioners' Officials." The toast list was a short one; most of the evening being spent in recreation.

In the matter of public lighting in Perth, Mr. W. B. M'Lusky, the Gas Engineer to the Corporation, has been conducting inquiries and experiments—chiefly with the view of testing the merits of high-power gas-lamps of the Welsbach and Lucas types. Experiments were also conducted in his own works by Mr. Hamilton, a member of the Town Council, who has come to be of opinion that for economy the Welsbach lamps are the better of the two. To this conclusion Mr. M'Lusky has added the explanation that the Welsbach lamp referred to is standardized to consume 7½ cubic feet of gas per hour, and to give an illuminating power of 40 candles per foot of gas consumed, or 300-candle power gross; while the Lucas lamp is standardized to consume 17 cubic feet of gas per hour, giving a gross lighting duty of 700 candles, which is about 41 candles per foot of gas consumed. In these days of keen competition with electricity, Mr. M'Lusky says that they appreciate very highly these experiments by consumers, as they tend to economy, efficiency, smaller bills, and popularization of gas all round.

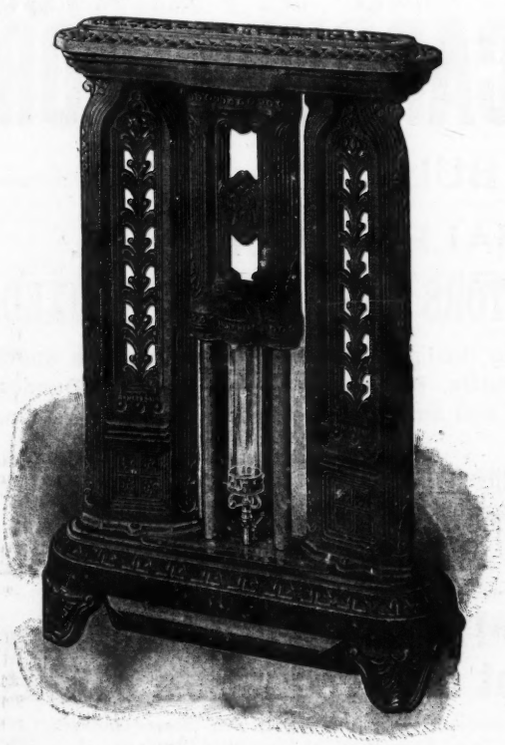
An exceedingly well-informed writer discoursed, in the columns of the "Aberdeen Free Press," on Tuesday, upon "The Use of Gas in Aberdeen." The variety of purposes, he wrote, for which coal gas is now employed as a heating agent and as a motive power forms one of the most interesting features of the development of its manufacture. The days when the householder regarded it as an illuminant and nothing else have long passed away; and its potentialities in other directions have been recognized to be of scarcely less importance. A table is given, which shows that in 1885, with a population of 115,000, there were 24,000 consumers of gas, and an annual consumption of 302 million cubic feet; in 1890, with a population of 124,000, there were 24,000 consumers, and an annual consumption of 338 millions; in 1895, with a population of 134,000, there were 25,000 consumers, and an annual consumption of 430 millions; in 1900, with a population of 145,000, there were 30,000 consumers, and an annual consumption of 568 millions; and in 1904, with a population of 164,000, there are 36,000 consumers, and the annual consumption is estimated at 650 millions. The writer then goes on to treat of the improved lighting which is obtained by the use of incandescent mantles. In regard to gas-engines, the number in use in Aberdeen in 1899 was 218; in 1900, 245; in 1901, 267; in 1902, 292; and in 1903, 326. The use of cookers and similar appliances has been another prolific cause of the increased consumption of gas. During the past fourteen years, the number of these (which are hired out by the Corporation) has increased nearly sevenfold. In 1890, there were 300; in 1895, 586; in 1900, 1630; and last year a total of 2000 was reached. Besides these, gas-fires and radiators, which are also hired out by the Corporation, are a popular means of heating. These are a few extracts from an article which is so reasonably pitched upon information that bears so much the impress of authenticity, that it is refreshing to find it in the pages of a daily newspaper. Its publication should do the Aberdeen Gas Department much good.

The agreement which I mentioned last week as having been come to between the Corporation of Falkirk and the North British Railway Company, with reference to railway access to the proposed new Corporation gas-works at Thornhill, was before the Town Council on Monday. There was a long discussion upon the railway scheme; some of the members of the Council objecting to the level crossings. There are to be four of these crossings. The motion of the objectors was to have the subject sent back for further negotiation with reference to the level crossings. This motion was, however, lost by one vote; and the agreement was adopted.

The Town Council of Airdrie, at a special meeting this week, had before them the deed of agreement between them and the Airdrie Gaslight Company, in terms of which the Company, in respect of a payment of £61,300, transfer their undertaking to the Corporation; stocks to be paid for at valuation, over and above that sum. The deed was signed on behalf of the Corporation, and now becomes final. The application by the Corporation for a Provisional Order authorizing the transfer will go forward as an unopposed measure; and an application by the Company for additional powers will, as a matter of course, be withdrawn.

This week a Parliamentary Commission has been sitting in Edinburgh to consider applications under the Private Legislation Procedure (Scotland) Act of 1899. Only two of the applications which have yet been reached are of interest here. One of them was by the Corporation of Leith, who are acquiring the tramways within their bounds, and are to work their traffic by the overhead trolley method of traction. In connection with this measure, the Edinburgh and District Water Trust and the Edinburgh and Leith Gas Commissioners sought the insertion of protective clauses for their pipes. Evidence was led to show that, as the scheme was framed, there would be danger of electrolysis. The Commissioners refused to insert an electrolysis clause; the Chairman—Lord Herries—intimating that, in their opinion, the Board of Trade regulations must suffice.

The other application had for its object the augmentation of the



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water supply in the Dunfermline district of Fifeshire, inclusive of a supply to the new Admiralty works at Rosyth. There was practical unanimity as to the construction of a reservoir and the laying of water-mains; but a number of millowners protested that the promoters were offering them too little compensation water. It was stated that the scheme would not abstract all the water available; and the opposition was thus robbed of much of its force. After hearing evidence, the Commissioners increased the quantity of compensation water from one-fourth of the whole water impounded to one-third—from 500,000 to 670,000 gallons per day. The water supplies for the four burghs of Dunfermline, Cowdenbeath, Inverkeithing, and Culross are taken from the same source; but the new scheme does not interfere with the existing work. The scheme to be carried out embraces the construction of a reservoir alongside that of the Dunfermline supply, to hold 205 million gallons of water, and to take a total of 2 million gallons per day, for all purposes. The agreement with the Admiralty is that they are to bear one-third of the capital outlay, to be entitled to one-third of the available water, and to maintain their own distributing system.

Gas-Engines for Generating Electricity.—Speaking at an election meeting, Mr. Hallett, one of the members of the Littleborough District Council, stated that the Council have a gas-engine which generates electricity for their offices, the free library, the technical school and grounds, and the central board school. Roughly speaking, there are 300 lights; and the engine costs 10d. per hour to work. He mentioned this because a statement had been circulated in the district to the effect that the gas consumed by the engine cost as much as it would cost to light up by gas all the buildings and places referred to. Suppose they had 250 gas-lights, each burning 4 cubic feet of gas per hour, it would cost something like 3s. 1d. per hour, instead of 10d. by working from the gas-engine.

Gas Profits at West Bromwich.—Considerable interest was manifested in the proceedings at the meeting of the West Bromwich Town Council on the 18th inst., in connection with the estimates for the new rate. In proposing that the Gas Committee apportion £1340 of gas profits in relief of the rate, Mr. Wilson said that when the estimates for the district rate were before the Committee, it was found that it would be necessary to increase the district rate by 4d. in the pound; and the Finance Committee, thinking this would be a calamity, approached the Gas Committee with the view of getting them to help the Council. Mr. Keys opposed the suggestion, on the ground that the profits they proposed to give in relief of the rates were more or less problematical, and they should really go to the depreciation fund. They were creating a very dangerous precedent, and the proper thing was to meet the deficiency out of the rates, so as to act as a warning to the Council. Dr. Brown said the Gas Committee had no right to hand over these profits so long as the undertaking was heavily in debt. The proposition was, however, carried.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 26.

Sulphate of Ammonia.

Demand has been fairly well sustained; but the activity expected at this season of the year has been wanting, and last week's prices are now barely obtainable. The closing quotations are £12 10s. per ton f.o.b. Hull, and £12 11s. 3d. to £12 12s. 6d. per ton f.o.b. Liverpool and Leith. Home demand has improved, but the Continent remains silent, notwithstanding the fact that sulphate of ammonia is now relatively cheaper than nitrate of soda, so that the market still has to depend upon Spain and the Colonies, and upon the requirements of speculators who have contracts to cover. In the forward position there is nothing special to report; buyers being only interested in near months, on the level of spot prices or at a discount, while makers still look for an improvement.

Nitrate of Soda.

This is firm at 10s. 3d. to 10s. 6d. per cwt., according to quality, on spot.

LONDON, *March* 25.

Tar Products.

There has been very little business doing in tar products during the past week; and as a rule prices have a downward tendency. The depression in pitch still continues, although business has been done in South Wales and on the Continent. Yet the prices accepted are again lower than those which have been recently ruling. So far as Belgium is concerned, dealers appear to be offering at very low prices indeed for forward delivery, which has the effect of deterring consumers from purchasing, as they believe that prices must go still lower if there is such an anxiety to sell on the part of dealers here. In South Wales, business has been done over the last six months of the year; and there are still buyers over this period. Consumers will not, however, pay the prices at present asked by manufacturers—believing, no doubt, in a still further reduction later on. There is a good deal offering in various quarters. Evidently manufacturers are anxious to clear out the whole of their make up to the end of June, so as not to carry any over during the summer months; but as consumers are fairly well stocked, it would seem as if still lower prices will have to be accepted if business is to be arranged to any considerable extent. Benzol remains in about the same position, and there is absolutely no demand. A small sale is reported to have taken place for home consumption at the equivalent of 10d. per gallon f.o.b.; but consumers are not at all anxious to buy, and there is absolutely no demand for export. The position of solvent naphtha remains unchanged. Manufacturers in the North are still anxious sellers, both for prompt and forward, at prices very much under those ruling in London. There is little or no demand for export just at present; while for home consumption there is an entire absence of inquiry. Creosote continues very quiet. Further business has been done at 1¼d.

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in the North of England; but the London Market is generally easier, owing to the fact that the scarcity of barrels renders business almost impossible for export. There is still some inquiry for anthracene for delivery over the last six months of the year; but manufacturers' ideas are above those at which consumers are willing to entertain business. The position of carbolic is decidedly peculiar. There appears to be a very good demand for crystals so far as England is concerned, and lately the German producers have shown signs of raising their price, although at present they are decidedly the cheapest sellers. The large English makers ask 7¼d. to 7½d. for 39-40 per cent.; but the Germans are still sellers at under 7d. In crude, the position is unchanged, and there is an absence of business; but as there are no stocks and the demand seems likely to improve, it is reasonable to suppose that the present depression will not be long maintained. Makers will not at present sell under 2s.; but consumers only offer 1s. 10d. and 1s. 10½d., at which price they report having secured some of their supplies. It is difficult, however, to trace any large sales at this price; and there is a general impression that 2s. per gallon will be the fair average value during the next three or four months. If makers are content with this price, it is probable that the German consumers will buy pretty freely; but any attempt to raise the price to 2s. 2d. or 2s. 3d. will certainly check business, as was the case on the last occasion.

The average values during the week were: Tar, 18s. to 23s. Pitch, London, 33s. 3d. to 33s. 9d.; east coast, 32s. to 32s. 9d.; west coast, 31s. to 31s. 6d. Benzol, 90 per cent., 10d.; 50-90 per cent., 7d. Toluol, 7d. Crude naphtha, 3d. to 3¼d.; solvent naphtha, 7d. to 8½d.; heavy naphtha, 10d. to 10½d. Creosote, London, 1 5/8d. to 1¾d.; North, 1¼d. to 1⅜d. Heavy oils, 2½d. to 2⅝d. Carbolic acid, 60 per cent., 1s. 11d. to 2s. Refined naphthalene, £5 to £8; salts, 22s. 6d. to 25s. Anthracene, "A" quality, 1¾d. to 2d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The market closes with a very quiet tone; and there is an absence of demand. Beckton still maintain their price at £12 15s., but do not report any actual business, either for prompt or forward delivery. The South Metropolitan Company still ask £12 16s. 3d. on their own special terms, and are reported to have declined business at £12 15s. Some small sales have been made in Hull at £12 10s. to £12 11s. 3d., according to quality; but only for prompt shipment. In Leith, makers still ask £12 12s. 6d.; but buyers will not pay this price, and £12 11s. 3d. may be taken as about the market value. Some small transactions are reported in Liverpool at £12 10s. to £12 11s. 3d., but only for prompt shipment. There is nothing doing for forward.

COAL TRADE REPORTS.

Lancashire Coal Trade.

A moderately steady tone is being maintained generally throughout the coal trade of this district, and the pit stoppages for the Easter Holidays (which may extend over four or five days in some instances), will for the time being give a check to surplus output coming upon the market. The situation, however, is anything but one of firmness; and this is especially the case with the lower qualities of round coal and inferior descriptions of engine fuel. Already competition in the open market has necessitated a good deal of informal giving way upon the nominal list rates, and large users are anticipating that within the next month or so there will be some more or less general official reduction in prices. So far, there has been comparatively little doing in the way of forward contracts to really test prices. This will come when the locomotive fuel and gas coal contracts have to be settled; and indications point to some further reduction upon even the low rates of last year. At the pit, 7s. 9d. to 8s. 3d. per ton is being taken on inland sales, for common round coals suitable for steam and forge purposes, and even less than this for shipment, as steam coals delivered at the Mersey ports are to be bought as low as 9s. to 9s. 3d. For some of the better qualities of steam and forge coals, quotations are held for averaging 8s. 6d. to 8s. 9d. per ton at the pit and 9s. 6d. up to 9s. 9d. at the ports. House-fire coals are for the present just about holding their price, except occasional special lots where collieries have to make prompt clearances. The better qualities of Wigan Arley coals range from 13s. and 13s. 6d. to 14s. per ton at the pit, seconds Arley and Pemberton four feet 11s. and 11s. 6d. to 12s. 6d., with common house-fire coals about 9s. and 9s. 6d. to 10s. 6d. The better qualities of engine fuel are still moving off fairly well, and it is exceptional where collieries have any large surplus, with prices steady at 6s. to 6s. 6d. for the best qualities, and 5s. to 5s. 6d. for good medium sorts. Inferior qualities of engine fuel continue, however, a drug on the market, both in Lancashire and in outside districts, and common Lancashire slack can be bought from 3s. 9d. to 4s. per ton upwards, with slack at the Derbyshire pits offering at from 1s. 6d. to 2s. per ton upwards.

Northern Coal Trade.

The active demand in the northern coal trade continues, and seems to make legitimate the higher prices that are quoted for some kinds of fuel. Best Northumbrian steam coals are rather irregular. About 9s. 10½d. per ton f.o.b. quoted for early delivery, when this is obtainable, and from 10s. to 10s. 6d. for delivery over the shipping season. Second-class steams are 8s. 6d., and steam smalls about 4s., with higher prices for season's shipment. Gas coals have been influenced by the heavy contracts which have been completed and are pending. A large part of the supply for the South Metropolitan Gas Company has now been arranged for at prices from 7s. 6d. to 8s., according to class. A small contract for gas coals for Sweden has been fixed at somewhat similar rates; and others are pending for London and for one of the largest of the local gas companies, which seem likely to result much as those named. Gas coke—being now less plentiful in make, and being freely exported—is rather firmer; but the prices quoted for shipment are just about those last noted.

Scotch Coal Trade.

Traders are better pleased with the situation they find themselves in than they have been during the winter. As last week, it is forward

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delivery which is the most promising. Prices are as yet not quotably higher; but they cannot long remain as they are if the demand continues. The quotations are: Main 7s. 3d. to 7s. 6d. per ton f.o.b. Glasgow, ell 8s. to 9s, and splint 8s. 6d. to 9s. The shipments for the week amounted to 222,705 tons—an increase upon the preceding week of 29,709 tons and of 34,598 tons upon the corresponding week of last year. For the year to date, the total shipments have been 1,998,994 tons – a decrease of 55,167 tons upon the same period of last year.

Richmond Water Supply.—On the recommendation of the Finance Committee, the Richmond Corporation have decided to apply to the Local Government Board for their sanction to a loan of £35,000, for the maximum period of sixty years, in connection with the agreement with the Metropolitan Water Board for the transfer to the Corporation of certain works used in the supply of the borough with water.

Tynemouth Corporation Water Finances.—Last Wednesday, the Tynemouth Corporation agreed to borrow £50,000 from the Public Works Loan Commissioners, upon the security of their water undertaking, at 3¼ per cent., repayable in 30 years. The Corporation have already spent considerably more than £300,000 upon their waterworks; and the object of the loan is to make a reservoir in the Font Valley, near Rothbury, from which will be supplied not only the borough, but the whole of the district along the pipe line.

Incandescent Gas Lighting for Schools.—At a recent meeting of the Norwich Education Committee, Mr. Crotch moved that incandescent gas lighting be installed in Heigham Street School, at an estimated cost of £46 4s. He said the Sub-Committee had made inquiries as to the cost of lighting the schools with electricity, and had received three tenders—£209, £164, and £92 respectively. Two tenders for lighting with incandescent gas were £52 and £46 4s.; and the Sub-Committee decided to accept the latter. They felt that they would not be warranted in spending a large sum of money on electric lighting at the present time. The motion was adopted.

Gas Exhibition in York.—A very successful exhibition of gas appliances has recently been held under the auspices of the York Gas Company. The goods shown were principally supplied by Messrs. Fletcher, Russell, and Co., Messrs. John Wright and Co., and Messrs. Wilsons and Mathiesons; while lectures on cooking by Mrs. H. M. Young constituted a valuable part of the proceedings. At the opening ceremony, the Chairman of the Company (Mr. J. R. Hill) made a lengthy speech, in which he reviewed all the latest developments of gas lighting and heating. He laid special stress on the superiority of this system of illumination over electricity for street purposes, as shown by the experience of London, which has lately been recorded in our pages. This is a matter which is just now of special interest to the citizens of York.

Improved Plant at the Clevedon Gas-Works.—At the recent ordinary meeting of the Clevedon Gas Company, the Chairman (Mr. E. Button), in referring to the accounts presented, mentioned that several of the items were larger than usual on account of the alterations and renewals at the works. They had now a complete set of furnaces in place of the old ones, and were consequently getting more gas out of the coal carbonized. They also had a complete set of purifiers. Old and leaky mains had been replaced by new ones; and they now felt ready to meet any rivals that might come into the field. They were most fortunate in having their Manager (Mr. J. Harger Pye), who had so ably planned and superintended the alterations and repairs; and he must largely share in the credit for what had been carried out during the past five years. Dividends were declared at the rate of 6 per cent. on the "A" and "B" shares, and of 5 per cent. on the "C" shares, free of income-tax.

New Joint-Stock Companies.—The Globe Light Company, Limited, has been registered with a capital of £5000 in £1 shares to adopt an agreement for the acquisition of the benefit of certain existing inventions relating to improvements in incandescent burners and bye-passes, &c., for gas and electricity, and to manufacture or deal in lamps, mantles, burners, gas-fittings, bye-passes, brackets, globes, films, meters, &c., for use in connection with any kind of illuminant. The Mellor Water Company, Limited, has been registered with a capital of £1000 in £1 shares, to adopt an agreement between W. Ward, B. C. Roberts, R. A. Yerburgh, and others, to supply water in the township of Mellor, near Blackburn, and to carry on the business of a water company. The Leeds Fire-Clay (Colonial) Company, Limited, has been registered with a capital of £5000 in £1 shares, to carry on the business indicated by the title, and that of merchants, importers, agents, &c. The Leeds Fire Clay Company, Limited, have consented to this registration.

The Kitson system of lighting has been awarded the Grand Prix at the Athens International Exposition. This is the fourth exposition at which the Kitson light has received the highest award for artificial illumination.

The General Heating and Lighting Company, Limited, has been registered with a capital of £5000 in 2s. shares, to adopt an agreement with J. Moeller, and to carry on the business of manufacturers and suppliers of incandescent lights and other apparatus for increasing and improving the illuminating or heating power of gas, spirit, oil, and other agents for producing light and heat, gas and general engineers, electricians, suppliers of gas and electricity, &c. There will be no initial public issue.

In the "JOURNAL" last week, we briefly announced the completion of a section of the new fire-clay works which Messrs. J. G. Stein and Co., of Bonnybridge, have erected at Castlecary. The works, which will occupy 28 acres of land on the estate of the Marquis of Zetland, are situated between the North British and Caledonian Railways, and in close proximity to the Forth and Clyde Canal, and they were commenced in November, 1902. They are arranged for a daily output of 100,000 fire-bricks; the section now in operation being capable of producing one-fifth of this number. It was formally opened on the 15th inst. by Mrs. Stein, in the presence of a party of personal friends.

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WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

GAS AND ELECTRICITY ENGINEER. Malvern Urban District Council. Applications by April 23.
MANAGER AND SECRETARY. Alfreton Gas Company. Applications by April 13.
MANAGER (GAS STOVE TRADE). No. 4186.
TRAVELLER (GAS STOVE TRADE). No. 4187.
DRAUGHTSMEN. W. J. Jenkins and Co., Retford.
FOREMAN (STOVE AND METER REPAIRING DEPARTMENT). Portsea Island Gas Company. Applications by April 11.
GENERAL FOREMAN. Dunfermline Gas Department.
FOREMAN FITTER. Waterford Gas Company.
ENGINE FITTER. West Bromwich Gas Department.

Pupil Wanted. No. 4188.

Situations Wanted.

ASSISTANT-MANAGER. No. 4178.
MANAGER OR MANAGER AND SECRETARY. No. 4189.

Plant, &c., for Sale.

CONDENSER (250,000 feet). Redditch Gas-Works.
STATION METER AND GOVERNOR. Williams and Co., Stoke-on-Trent.
STATION METER. Tunbridge Wells Gas Company.
GASHOLDER. Staines and Egham Gas Company. Tenders by April 18.
PURIFIERS. Salisbury Gas Company.

Plant Wanted.

SCRUBBER TOWER, CONDENSER, PURIFIER, VALVES, &c. No. 4185.
PURIFIERS AND CONNECTIONS. Wadhurst, &c., Gas Company. London Offices.

Company Meeting.

BRITISH GASLIGHT COMPANY. Offices, March 30. Twelve o'clock.

Sales of Stocks and Shares.

BARKING GAS COMPANY. April 12.
GRAND JUNCTION WATER COMPANY. April 12.
HASTINGS AND ST. LEONARDS GAS COMPANY. April 12.
WEST HAM GAS COMPANY. April 12.
WEST SURREY WATER COMPANY. April 12.

Shares Wanted.—Martin, Streatham.

TENDERS FOR

Brass, Copper, and Lead Tubing, Fittings, &c.
WARRINGTON GAS DEPARTMENT.
WIGAN GAS DEPARTMENT. Tenders by April 18.

Bricks, &c.
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Coal and Cannel.
BANGOR (CO. DOWN) CORPORATION. Tenders by April 4.
COMMERCIAL GAS COMPANY Tenders by March 30.
CONGLETON GAS DEPARTMENT. Tenders by April 5.
NEWPORT (FIFE) GAS DEPARTMENT. Tenders by April 7.
WALLASEY CORPORATION. Tenders by April 20.

Cookers.
WARRINGTON GAS DEPARTMENT.

Fire Clay Goods, Retorts, &c.
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EAST DEREHAM URBAN DISTRICT COUNCIL. Tenders by April 18.

General Stores, Castings, Tin, Oils, Flexible Tubing, Shovels and Forks, &c.
WALLASEY CORPORATION. Tenders by April 20.
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WIGAN GAS DEPARTMENT. Tenders by April 18.

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No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EASTER HOLIDAY.

In consequence of the EASTER HOLIDAY, all Communications for the next issue of the "JOURNAL" and Orders respecting ADVERTISEMENTS should be received at the Office NOT LATER than the FIRST POST ON SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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GAS EXHIBITIONS.

A. E. PODMORE & CO. will be pleased to make arrangements to lend their High-Power, Low-Pressure, Recuperative Incandescent Gas-Lamps, BURNERS DUST AND INSECT PROOF, to Gas Companies holding Exhibitions.
This Lamp having no wearing parts to get out of order, is the most suitable for the Hire-Purchase System. Electric Light Eclipsed. 25A, HATTON GARDEN, E.C. Telephone 6600 CENTRAL. Telegrams: "PROMEROPE, LONDON."

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

APPOINTMENT wanted as Assistant- MANAGER in Gas-Works. Trained at Engineering Works. Recently prepared Drawings and Superintended erection of large up-to-date Gas-Works. Good knowledge of Chemistry and Gas-Works Routine. Honours Gas Manufacture.
Address No. 4178, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

THE Appointment of Manager for Meter, &c., Department (No. 4148) has NOW BEEN MADE, and unsuccessful Applicants are THANKED for their trouble.

APPOINTMENT Wanted as Manager, or MANAGER and SECRETARY of Gas-Works. Has had Colonial Experience. Thoroughly Practical from Retort to Burner, including Erection and C. W. Gas Plant. Past success guarantee for future. Unexceptional References for character and ability. Honours City and Guilds Examination.
Address No. 4189, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

DRAUGHTSMEN, Experienced in Coal and Coke Handling Plants and Gas-Works Plants generally.
Apply, stating Experience and Salary required, to W. J. JENKINS AND Co., LIMITED, RETFORD.

THE Engineer and Manager of a Gas-Works in the North of England, making about 300 Million cubic feet per annum, is open to take a PUPIL with premium.
Address No. 4188, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, Good Engine Fitter. Pre-ference given to one with Gas-Works Experience. Wages 36s. per week.
Applications, giving References, to be sent to the ENGINEER, Corporation Gas-Works, Albion, WEST BROMWICH.

TRAVELLER wanted to represent Gas-Stove Firm in London and District. Must be Experienced, Steady, and able to introduce New Business.
State Experience and Salary required to No. 4187, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

GAS-STOVE TRADE.

GENTLEMAN with experience wanted to take ENTIRE CHARGE of established business. Must also be able to influence orders with Corporations, Gas Companies, &c. Preference given to one who could invest money in the business.
Apply, by letter, stating Particulars, to No. 4186, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CITY OF WATERFORD GAS COMPANY.

FOREMAN Fitter wanted, to superin-tend Fitters' work and Advise Consumers. Must be well up in Main and Serviceing, Gas Engines, interior House Fitting, including Fires, Cookers, Geysers, &c.; also Incandescent Lighting, public and private, High and Low Pressure Systems. Good opening for smart, capable Man. Wages £2 per week.
Apply, in own handwriting, stating Experience, Age, &c., to Mr. J. G. TOOMS, Manager, Gas-Works. WATERFORD.

THE Directors of the Alfreton Gas Company invite APPLICATIONS for the appointment of MANAGER and SECRETARY of their Gas-Works.
Salary £140 per Annum, with House, Coals, Gas, &c.
Applicants must have had Experience in the Manufacture of Gas upon the latest principles.
Applications, with *copies* of Testimonials, to be addressed to the Chairman, Gas Offices, Alfreton, on or before April 13, 1904.

A. FORRETT,
Manager and Secretary.

PORTSEA ISLAND GAS-LIGHT COMPANY.
RUDMORE WORKS.

STOVE AND METER REPAIRING DEPARTMENT.

WANTED, a Foreman to take Full Control (under the Engineer) of the above Department. Applicants must be capable of managing men, and must either have had Control, or be occupying a similar position.
Apply, by letter only, to the undersigned, stating Age, Wages required, with References, on or before April 11, 1904.

J. D. ASHWORTH,
Engineer.

Engineer's Office, Gas-Works,
Flathouse, Portsmouth,
March 25, 1904.

MALVERN URBAN DISTRICT COUNCIL.

GAS AND ELECTRICITY ENGINEER.

THE Council invite Applications for the appointment of GAS ENGINEER and MANAGER, and ELECTRICAL ENGINEER, at a Salary of £400 per Annum, with House, Coal, and Gas.
Candidates must be between the age of 28 and 45 years, and have had practical experience in the management of Gas-Works with Inclined Retorts and Coal-Breaking and Elevating Machinery, and also thoroughly understand the manufacture of Sulphate of Ammonia. The make of Gas is about 130 million cubic feet.
Candidates must also have had Experience and have been a properly trained Electrical Engineer, and accustomed to an Alternating Current Station.
The person appointed will be restricted from engaging in private practice, and will be required to devote the whole of his time to the duties of his office.
Applications, endorsed "Gas and Electricity Engineer," stating Age, Qualifications, and Experience, and accompanied with *copies* of not more than Three recent Testimonials, addressed to me at the under-mentioned office, not later than Saturday, the 23rd day of April, 1904.
Canvassing members of the Council, either directly or indirectly, will disqualify.

H. L. WHATLEY,
Clerk of the Council.

Council Offices,
Malvern, March, 1904.

ROBERT DEMPSTER & SONS, Ltd. Contractors for Complete CARBONIZING PLANTS and every description of GAS APPARATUS and ELEVATING and CONVEYING PLANT, ROSE MOUNT IRON-WORKS, ELLAND.

TO SUBSCRIBERS.

ROBERT DEMPSTER & SONS, LTD., of Rose Mount Iron-Works, Elland, Yorkshire, beg to inform Subscribers to the "JOURNAL OF GAS LIGHTING," that the series of COLLOTYPE VIEWS OF GAS PLANT executed by them is being issued in the form of inserted sheets fortnightly, Six of which have already been published, and respectfully suggest that SUBSCRIBERS SHOULD PRESERVE THE WHOLE SERIES FOR FUTURE REFERENCE.

DUNFERMLINE CORPORATION GAS-WORKS.

WANTED, a General Foreman. Wages to commence 35s. per week. House on Works, with Coal, Gas, and Taxes free.
Applicants in first case only to state Training, Experience, and Age to

A. WADDELL,
Manager.

WANTED, Three or Four Second-Hand PURIFIERS and CONNECTIONS, about 6 ft. by 3 ft. 6 in., more or less. Lowest price delivered to Wadhurst Station, S. E. Ry., Sussex, to E. EATON, Managing-Director, Wadhurst, Ticehurst, and District Gaslight and Coke Company, 99, Cannon Street, LONDON, E.C.

WANTED to purchase Gas Shares Stock, or Debentures of any good dividend-paying Company; also Water-Works Shares and Debentures. Size and location of Company immaterial. Securities that have failed to realize reserves at auction considered.
Address Mr. MARTIN, 41, Shrubbery Road, Streatham, LONDON.

WANTED, good Gas Apparatus:—
CONDENSER, 8-inch Pipes, Vertical or Horizontal, former preferred.
SCRUBBER TOWER, Washer in bottom an advantage, about 5 ft. by 25 ft. Steel or Cast. Complete.
PURIFIERS, Four 10 feet squares, &c., complete.
FOUR-WAY VALVES. Four 8-inch wanted.
State Particulars, Conditions, and Prices on Rail, or as now fixed. Must be cheap.
Address No. 4185, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

PURIFIERS.

THE Salisbury Gas Company desire to dispose of a set of Four PURIFIERS, each 12 feet square, Cockey's Dry-Faced Centre and Check Valves, Connections, Columns, and Girders for supporting same.
Offers to N. H. HUMPHRYS, Gas Engineer, SALISBURY.

TO BE SOLD—New Single Gasholder, 50 feet diameter by 15 feet deep, with Six Wrought-Iron Standards, top Ties, and Suspension Gear if needed. Ready for erection.
Write J. WRIGHT, 181, Queen Victoria Street, LONDON, E.C.

FOR SALE—One Station Meter, 5 feet diameter, by Braddock, with 6-inch Valves. Also One Braddock GOVERNOR, with 7-inch Inlet and Outlet Pipes, Bye-Pass, and Valves.
Apply to H. J. WILLIAMS AND Co., Kidsgrove, STOKE-ON-TRENT.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill DEWSBURY.

FOR SALE, Cheap, the following good Second-Hand Gas Plant:—
LIVESEY'S PATENT WASHER to pass 250,000 cubic feet per diem. 8-inch Connections.
COCKEY'S PATENT WASHER to pass 100,000 cubic feet per diem. 6-inch Connections.
KIRKHAM'S PATENT WASHER to pass 150,000 cubic feet per diem. 5-inch Connections.
W.I. SCRUBBER, 20 feet high by 3 feet diameter.
Two 8 feet square PURIFIERS, with 8-inch Valves complete.
Also various other GAS PLANT. Inquiries invited.
Apply to SAMUEL WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

GOOD GAS PLANT for Sale, Cheap:—
GASHOLDER AND CAST TANK, 40,000 cubic feet capacity, re-fixed cheap; also other sizes.
NEW HOLDERS, STEEL TANKS, made and tendered for.
PURIFIERS—Sets of 4 feet, 5 feet, 6 feet, 8 feet, 10 feet, 12 feet, and 18 feet square. Set of Four PURIFIERS, 21 feet by 28 feet by 6 feet deep.
SCRUBBERS—Single and in pairs, 6 feet by 28 feet, 8 feet by 60 feet, 10 feet by 60 feet.
WASHERS—"Livesey," "Clapham," "Holmes," overhauled.
METERS—Governors up to 18 inches. New Drums.
EXHAUSTERS, ENGINES up to 60,000 cubic feet per hour in Stock.
Buy from the largest Dealers in Second-hand Plant, and who guarantee to leave all Apparatus sold in good working order and satisfactory to the Company.
J. FIRTH BLAKELEY AND Co., Thornhill, DEWSBURY.

FOR SALE—A 40,000 cubic feet Station METER, by Wright.
Further Particulars on application to the ENGINEER, Gas-Works, TUNBRIDGE WELLS.

CONDENSER for Sale. In splendid Condition. Cheap. Capacity 250,000 Cubic Feet per Twenty-four hours.
Apply to A. E. LAYTON, Manager, Gas-Works, REDDITCH.

TENDERS FOR COAL.

THE Town Council of Newport, Fife (Gas Department), invite TENDERS for the supply of CANNEL, Single, Double, and Treble Nuts, and Caking Dross, per Ton delivered at their Railway Siding, for Twelve Months.
Tenders to be addressed to John Scrimgeour, Esq., Town Clerk, not later than Thursday, the 7th of April.
The Council do not bind themselves to accept the lowest or any Tender.

JOHN F. BLACK,
Manager.

Gas-Works, Newport,
March 26, 1904.

BRIDGEWATER COLLIERIES COKE-WORKS.
(THE EARL OF ELLESMERE).

TENDERS are invited for the Light Oil produced at the above Works for a period of Six or Twelve Months from the 1st of May, 1904, delivered into contractor's tanks at the Bridgewater Colliery Siding, Wharton Hall, on the Pendleton and Hindley branch of the L. & Y. Railway; or at the Brackley Siding, on the Little Hulton Mineral branch of the L. & N. W. Railway.
Tenders, endorsed "Tenders for Light Oil," to be addressed to Mr. THOMAS M. BROWN, Bridgewater Coal Office, 4, Chapel Walks, MANCHESTER, on or before the 16th of April.

THE Urban District Council of Hindley are prepared to receive TENDERS for the purchase of the TAR and AMMONIACAL LIQUOR produced at their Gas-Works—for Tar, during the ensuing Twelve Months, and Ammoniacal Liquor Six Months.
Full Particulars, with Form of Tender, can be obtained on application to Mr. H. O. Timmins, Gas and Water Engineer.
Sealed Tenders, endorsed "Tender for Tar and Ammoniacal Liquor," to be lodged with the undersigned not later than Monday, the 18th of April, 1904.

By order,
THOMAS ROBEY,
Clerk to the Council.

Offices: Cross Street,
Hindley, March 23, 1904.

TENDERS FOR COAL.

THE Urban District Council of Bangor, Co. Down, invite TENDERS for supplying about 2000 Tons of best Double-Screened GAS COAL, to be Delivered into Carts at Bangor Quay, at such times and in such quantities as may be required from the 11th of April next.
Tenders should be accompanied by Analyses placed in sealed envelopes, marked "Tender for Coal," and must reach me not later than Monday, April 4 next.
No Tender Forms issued.
The Council do not bind themselves to accept the lowest or any Tender, and will require security for the due and faithful performance of the Contract.

JAMES MILLIKEN,
Clerk of the Council.

Town Hall, Bangor,
County Down, March 16, 1904.

COUNTY BOROUGH OF HUDDERSFIELD.

STEEL PURIFIER-COVERS.

THE Gas Committee of the Corporation of Huddersfield invite TENDERS for the supply and erection at the Gas-Works of Two, Four, or Six COVERS FOR PURIFIERS, 40 ft. by 30 ft.
Forms of Tender, Drawing, and Specification may be obtained on application to the undersigned.
Sealed Tenders, endorsed "Purifier-Covers," must be delivered, free of charge, addressed in the handwriting of the tenderer or his agent, to the Town Clerk (J. Henry Field, Esq., LL.B.), Town Hall, Huddersfield, not later than the 12th day of April, 1904.
The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
EDWARD A. HARMAN, M.Inst.C.E.,
Engineer and Manager.

Gas-Works, Huddersfield,
March 21, 1904.

COUNTY BOROUGH OF WARRINGTON.

THE Gas Committee of the above Borough invite TENDERS for the supply of the under-mentioned GOODS.
Full Particulars can be obtained on application, before the 31st inst., to Mr. W. S. Haddock, Engineer to the Works.

1. Bolts and Nuts.
2. Brass and Copper Tubing.
3. Brass Fittings.
4. Cast-Iron Pipes.
5. Cast-Iron Connections.
6. Cast-Iron Lamp-Pillars.
7. Castings.
8. Copper Street-Lamps.
9. Cookers.
10. Common Paving & other Bricks.
11. Fire-Brick.
12. Fire-Clay.
13. Flexible Tube.
14. Lead and Compo. Pipe.
15. Lime.
16. Oils.
17. Rails, Fasten's, Crossings, &c.
18. Retorts.
19. Retort Mouthpieces and Lids.
20. Steel Joists.
21. Wet and Dry Gas-Meters.
22. Wrought-Iron Tubes.
23. Wrought-Iron Fittings.

FREDK. TAYLOR,
Secretary.

Gas Offices, Warrington,
March 24, 1904.

ALTRINCHAM GAS COMPANY.

THE Directors are prepared to receive TENDERS for the erection of a new RETORT-BENCH on the Regenerative System, with Retort Bracing, &c., and Charging-Floor, together with the Raising of the Walls and Roof of part of a Retort-House at their Works.

The Drawings may be seen, and copy of the Specification obtained, any time after April 4, on application to Mr. J. E. Lamb, General Manager, Gas Offices, Altrincham.

Sealed Tenders, endorsed "Tender for Retort-Bench, &c.," and addressed to the Chairman of the Company, to be sent so as to reach the Gas Offices not later than noon on Wednesday, April 13, 1904.

The Directors do not bind themselves to accept the lowest or any Tender.

F. R. B. LINDSELL,
Secretary.

Gas Offices, Altrincham,
March 24, 1904.

COUNTY BOROUGH OF WIGAN.

(GAS DEPARTMENT.)

THE Gas Committee invite Tenders for the supply of STORES over the Year ending on March 31, 1905, as follows:

(a) Wrought-Iron Tube and Fittings.
(b) Brass and Copper Tube and Fittings.
(c) Lead Gas-Pipe.
(d) Street-Lamps.
(e) Merchant Iron.
(f) Weed Brooms.
(g) Shovels and Coke Forks.
(h) Wood Troughing and Covering.
(m) Galvanized Stove Pipe and Connections.
(n) Cast Mains and Connections.
(o) Screw and Retort Bolts.
(p) Galvanized Buckets.
(q) Sulphuric Acid.
(r) Surplus Tar.
(s) Benzol (90 per cent.).

Forms of Tender may be obtained from the undersigned.

The Committee do not bind themselves to the acceptance of any Tender.

Tenders, sealed and endorsed with the name of the article tendered for, to be delivered to Harold Jevons, Esq., Town Clerk, Town Hall, on or before Monday, the 18th of April next ensuing.

A sample of each article to be forwarded, addressed to the Gas Engineer.

J. TIMMINS,
Engineer.

Borough Gas-Works,
Wigan, March 24, 1904.

WALLASEY URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

TO COLLIERY OWNERS AND OTHERS.

THE Wallasey Urban District Council are prepared to receive TENDERS for the supply of about 32,500 Tons of GAS COAL and CANNEL for their Gas-Works, delivered in trucks at Duke Street, Birkenhead, or into the Works, *via* the Wirral Railway, separately for One, Two, or Three Years, from the 30th of June next.

A copy of the Specification and any further Information can be obtained on application to the Engineer, Mr. J. H. Crowther, at his Office at the Works, Great Float, near Birkenhead.

Sealed Tenders, on the Contractor's own Form, endorsed "Tender for Gas Coal and Cannel," and addressed to the undersigned, to be delivered at my Office as below not later than the 20th of April, 1904.

The successful Contractors will be required to enter into a bond, with approved sureties, for the due fulfilment of their respective Contracts.

The Council do not bind themselves to accept the lowest or any Offer.

By order,
H. W. COOK,
Clerk and Solicitor.

Public Offices, Egremont,
Cheshire, March 23, 1904.

WALLASEY URBAN DISTRICT COUNCIL.

(GAS AND WATER DEPARTMENT.)

SUPPLY OF STORES.

THE Wallasey Urban District Council are prepared to receive TENDERS for the supply, over a period of Twelve Months from the 30th of June next, of the following among other Articles; being the principal STORES required for use at their Gas and Water Works—viz.,

Steam Tubing.	Wrought-Iron Bars, Plates, &c.
Gun-Metal Stopcocks, Ferrules, Unions, &c.	Gas-Fittings.
Lead Pipe.	Wash Leathers.
Retorts and Fire-Bricks.	Cast-Iron Main Pipes.
Buxton Lime.	Gas and Water Meters.
Bolts and Nuts, Set-pins, &c.	Copper Sheets, &c.
Lamp Columns.	Cast-Iron Street Boxes.
Iron and Brass Main Cocks.	Oils, Brushes, and Vestas.
Valves and Hydrants.	Firebars.
Block and Sheet Tin.	India-Rubber Tubing, &c., &c.
Vitriol.	

Samples referred to in the Schedule may be seen, and Forms of Tender obtained, on application to the Engineer, Mr. J. H. Crowther, at his Office at the Works, Great Float, near Birkenhead.

Sealed Tenders on the Form provided, endorsed "Tender for Gas and Water Stores," and addressed to the undersigned, to be delivered per post at my Office as below, not later than the 20th of April, 1904.

The successful Contractors will be required to enter into a bond, with approved sureties, for the due fulfilment of their respective contracts.

The Council do not bind themselves to accept the lowest or any Offer.

By order,
H. W. COOK,
Clerk and Solicitor.

Public Offices, Egremont, Cheshire,
March 23, 1904.

BOROUGH OF CONGLETON.

THE Gas Committee invite Tenders for the supply of best screened GAS COAL or NUTS for Gas-Making purposes, to be delivered in Senders' or Railway Company's Trucks at Brunswick Wharf, Congleton.

Forms of Tender and Conditions may be obtained from the undersigned.

Tenders, endorsed "Gas Fuel," to be delivered at the Office of E. A. Plant, Town Clerk, Congleton, not later than Twelve noon, on Tuesday, April 5, 1904.

The Committee do not bind themselves to accept the lowest or any Tender.

JAMES SMITH,
Engineer and Manager.

Gas-Works, Congleton,
March 15, 1904.

EAST DEREHAM URBAN DISTRICT COUNCIL.

TENDERS are invited for –

(*A*) Single-Lift GASHOLDER prepared for Telescoping, 68 feet in diameter and 20 feet deep.
(*B*) GASHOLDER TANK, 72 feet in diameter and 20 ft. 6 in. deep, built of brick in cased concrete.
(*C*) GASHOLDER and TANK combined.

Plans and Specifications can be seen on application to Mr. Henry Kitson, Gas Manager, East Dereham.

Tenders, endorsed "Tender for Gasholder," to be sent in to me, the undersigned, not later than the 18th of April next.

B. H. VORES,
Clerk to East Dereham
Urban District Council.

March 21, 1904.

COMMERCIAL GAS COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive TENDERS for the supply of 220,000 Tons of clean, dry, unscreened, fresh-wrought GAS COALS, delivered f.o.b. to the Company's Steamers at any suitable Port, during the Year ending the 30th of April, 1905.

The deliveries to be in about equal monthly quantities throughout the Year.

Payment in cash monthly.

Parties desiring to Tender for more than One Year must state separately the price and quantity offered for each Year.

Particulars and Forms of Contract may be obtained from the Engineer, Mr. S. H. Jones.

The Directors do not bind themselves to accept the lowest or any Tender.

Tenders, sealed and endorsed "Tender for Coals," to be addressed to the Chairman of the Coal Committee, and delivered at the Company's Offices not later than Nine o'clock on the 30th inst.

Commercial Gas-Works,
Stepney, E., March 17, 1904.

STAINES AND EGHAM GAS COMPANY, LIMITED.

GASHOLDER FOR SALE.

THE Directors invite Tenders for the purchase (Buyer to dismantle and remove) of a TELESCOPIC GASHOLDER, 50 feet diameter, Two Lifts 18 feet, Eight Cast-Iron Standards, Intermediate Girders, and Cast-Iron Tank complete. The Plant can be seen by appointment with the Manager.

Sealed Tenders, endorsed "Holder," to be delivered to me on or before Monday, April 18 next.

The Directors do not bind themselves to accept the highest or any Tender, and reserve the right of accepting the whole or a portion only of any one Tender.

By order,
GEO. H. SAYERS,
Secretary.

Gas Offices: The Causeway,
Near Staines, March 25, 1904.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at MR. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the

HASTINGS AND ST. LEONARDS GAS COMPANY.

NEW ISSUE OF £10,000 ADDITIONAL FIVE PER CENT. ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 12, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

GAS AND WATER ORDINARY STOCKS AND SHARES

IN THE

WEST SURREY WATER COMPANY,
BARKING GAS COMPANY,
WEST HAM GAS COMPANY.

MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, April 12, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices.

Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 30th inst., at Twelve o'clock precisely, to transact the usual Business, and to declare a Dividend for the Half Year ended the 31st of December last.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 19th and RE-OPENED on the 31st inst.

By order of the Court of Directors,
H. B. CHAMBERLAIN,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
March 9, 1904.

GRAND JUNCTION WATER-WORKS COMPANY.

SALE BY TENDER OF THREE-AND-A-HALF PER CENT. REDEEMABLE DEBENTURE STOCK.

GRAND JUNCTION WATER-WORKS ACT, 1902.

NOTICE is Hereby Given, persuant to the Grand Junction Water-Works Act, 1902, that the Directors of the Company intend to offer for SALE BY TENDER such an amount of THREE-AND-A-HALF PER CENT. REDEEMABLE DEBENTURE STOCK created under that Act as will produce, after payment of expenses, the sum of £100,000 cash.

This Stock may be redeemed at par at any time after the expiration of 25 Years from the date of issue on Six Months' previous notice in writing to the holder.

On the transfer of the Company's Undertaking, persuant to the Metropolis Water Act, 1902, this Stock will, under the provisions of that Act, be secured on the Water fund of the Water Board, and have, in addition, the security of the rates, as provided by that Act.

Tenders must be delivered at the Company's Offices, 65, South Molton Street, W., not later than Twelve o'clock noon, on Tuesday, the 12th day of April next.

The Purchase Money must be paid on the 24th day of April, and Interest at the rate aforesaid on the Stock will commence to accrue from the date of payment, and be paid at the same time the interest is paid on the existing Debenture Stock.

Particulars and Conditions of Sale, together with Form of Tender, may be obtained at the Offices of the Company, or will be forwarded on application.

By order of the Court of Directors,
J. GOODWIN,
Secretary.

65, South Molton Street, W.,
March 14, 1904.

BOOKS AND LEAFLETS

TO BE OBTAINED OF

WALTER KING,

11, BOLT COURT, FLEET STREET, E.C.

THE FLOW OF GASES AND PROPORTIONING GAS-MAINS.—By F. SOUTHWELL CRIPPS, Assoc. M.Inst.C.E. *Price 7s. 6d.*

REPORTS OF DISTRICT ASSOCIATIONS OF GAS ENGINEERS AND MANAGERS FOR 1903. *Price 5s. 6d.*

GAS COMPANIES' BOOK-KEEPING.—By JOHN HENRY BREARLEY and BENJAMIN TAYLOR, of Longwood. *Morocco Gilt*, 18s.

AUTOMATIC METER REGISTER.—By ROBERT P. KEYS. *In sizes to record* 1000 *Meters, with Index, half bound, 42s.; to record* 500 *Meters*, 35s.; *to record* 250 *Meters*, 31s. 6d.

SANDELL'S GAS COMPANIES' EXPENDITURE JOURNAL.—*Price, two quires*, 36s.; *three quires*, 45s.

SANDELL'S GAS COMPANIES' RENTAL-BOOK.—*Price, two quires*, 36s.; *three quires*, 45s.

SANDELL'S ANALYZED WAGES BOOK.—*Price, two quires*, 15s.

TABLES OF VALUES, DISCOUNTS, DIVIDENDS, AND WEIGHTS AND MEASURES FOR USE IN GAS OFFICES. By THOMAS NEWBIGGING, M.Inst.C.E. *Price 2s.*

DOWDING'S WAGES TABLES, Calculated for Wages payable by the hour.—By EDWIN DOWDING. *Price 3s. 6d*

GAS-WORKS DIRECTORY, 1902-1903. *Price 6s.*

Other Books supplied (Post Free) at Published Prices.

HEATHCOTE GAS COAL.

Rich in Illuminating Power and yield of Gas

Above the Average in Weight and Quality of Coke.

Maintains a High Standard in Residuals.

THE GRASSMOOR CO., LD.,

CHESTERFIELD.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
97, WELLINGTON STREET, GLASGOW.

Prices and Analysis of all the Scotch Cannels on Application.

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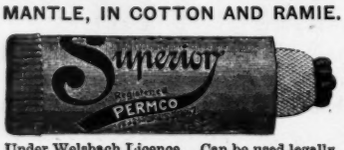

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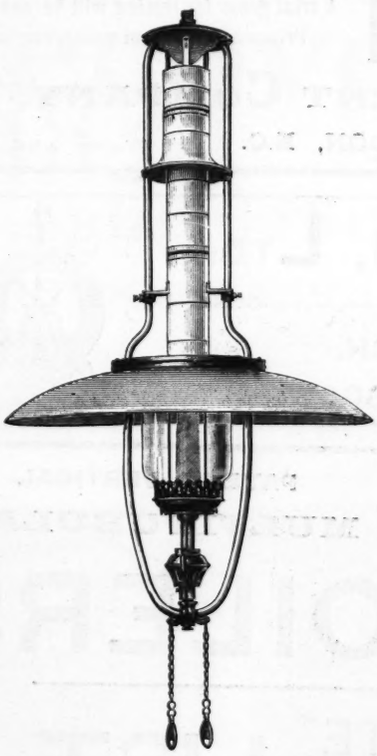

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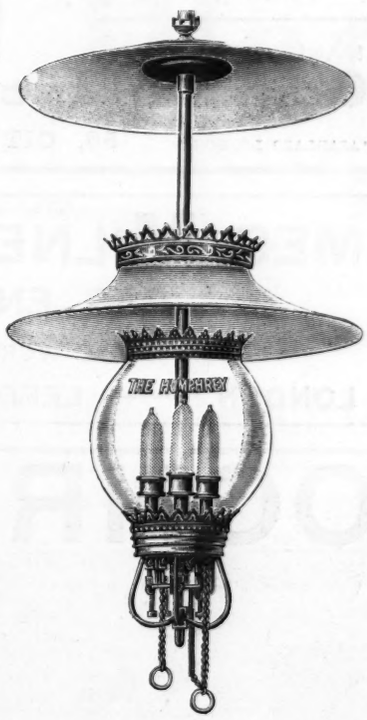

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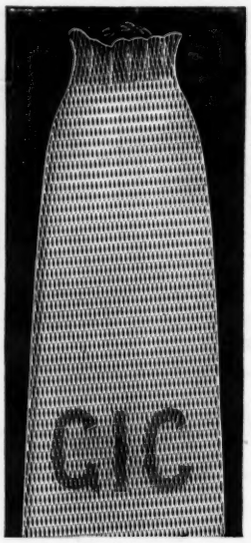

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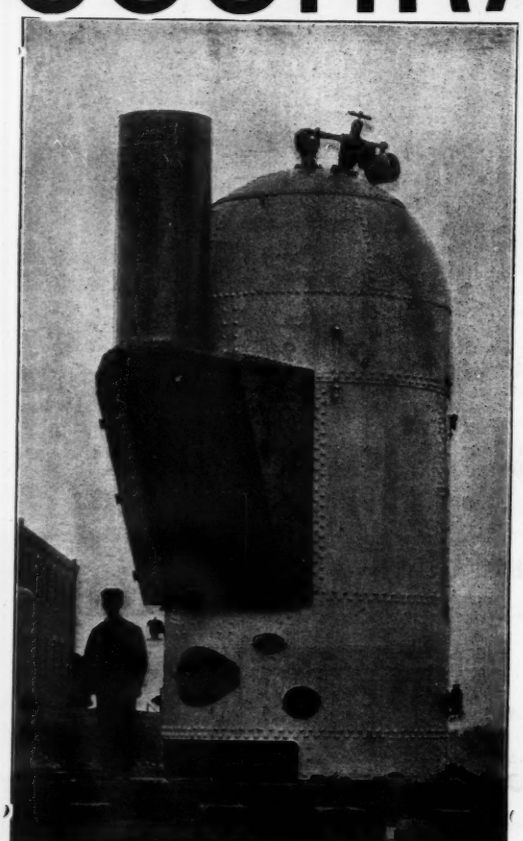

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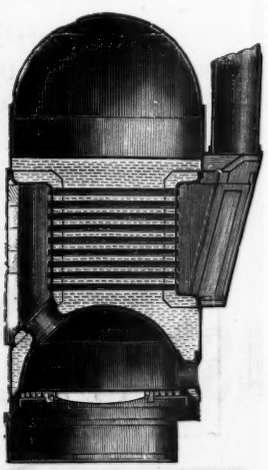

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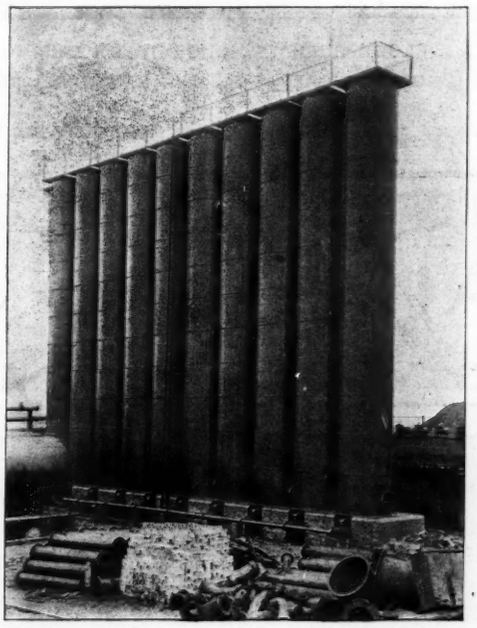

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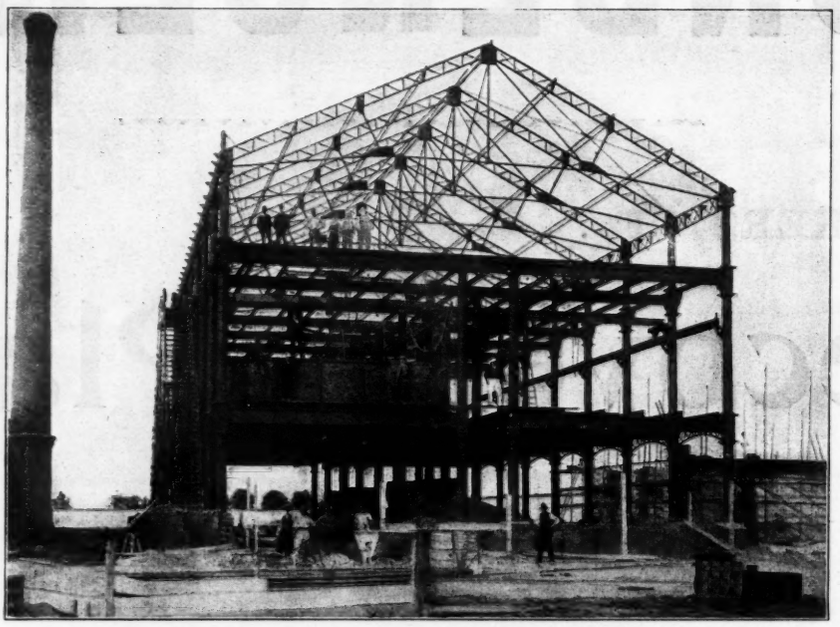

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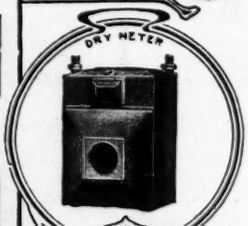

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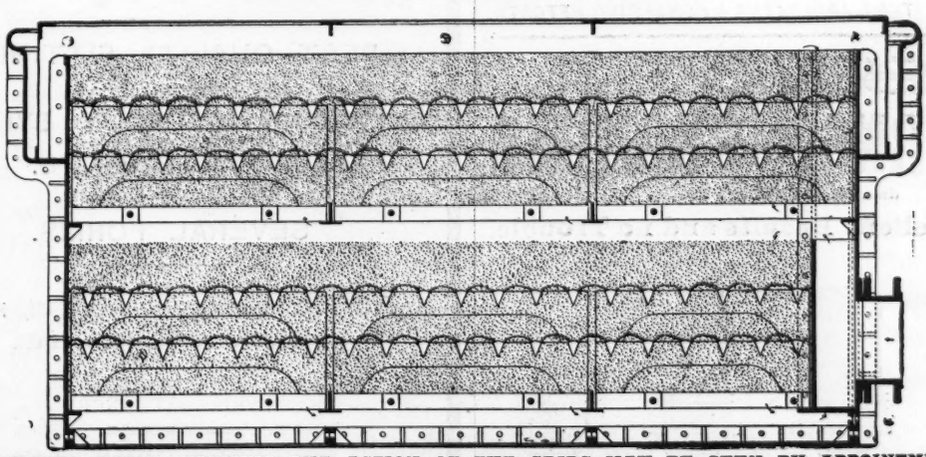

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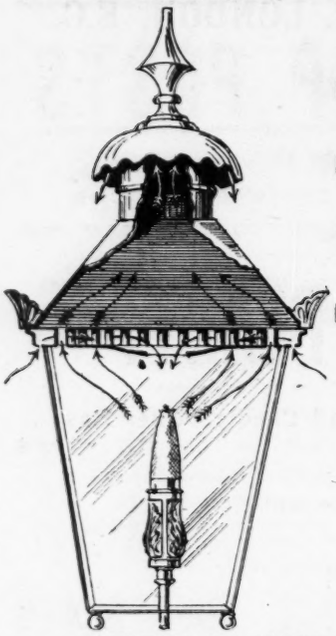

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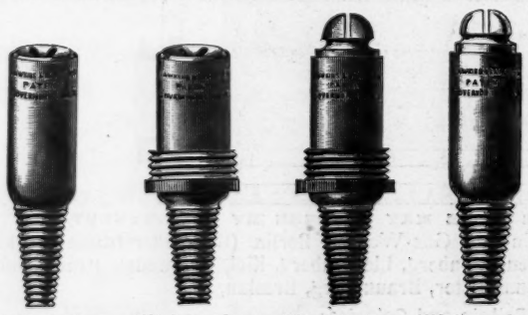

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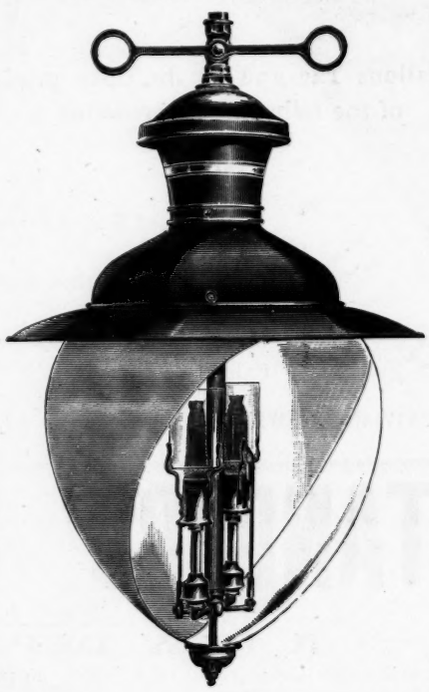

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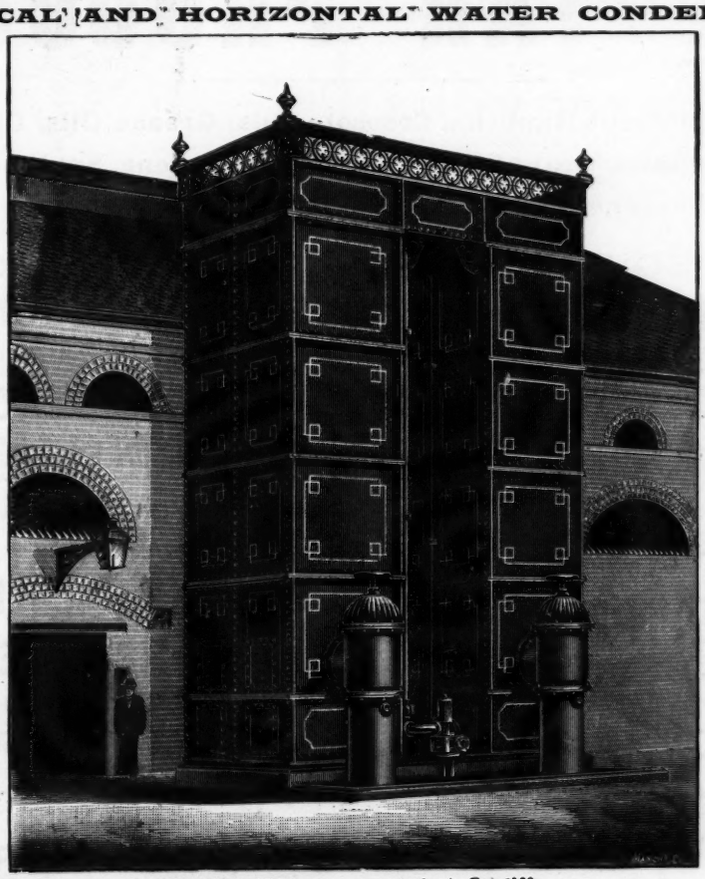

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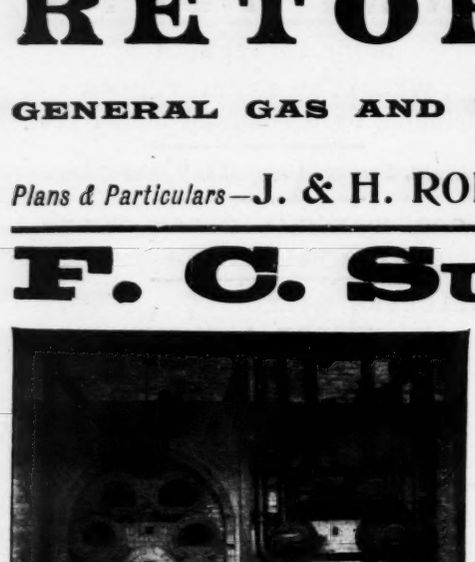

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[REGISTERED AS A NEWSPAPER.

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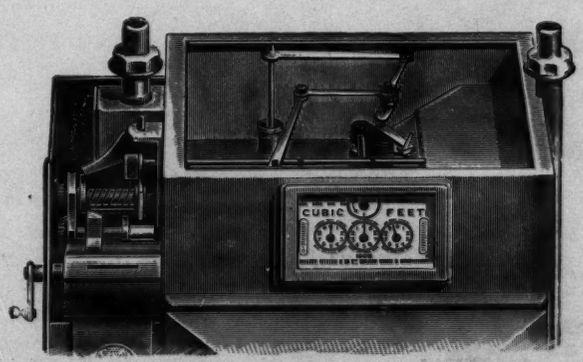

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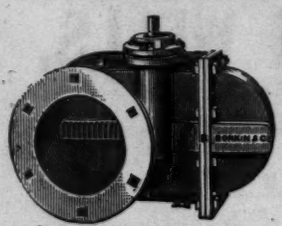
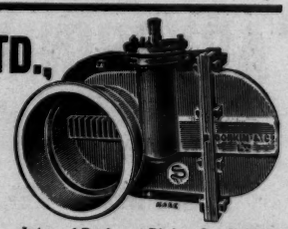


Internal Rack and Pinion Gas-Valve (Flange).



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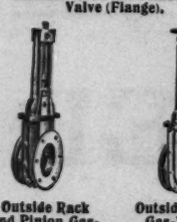


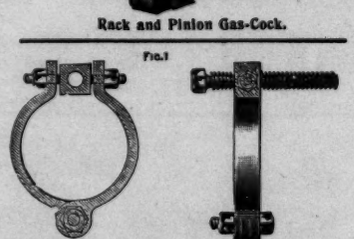
Outside Rack and Pinion Gas-Valve. Fig. 8.

Outside Screw Gas-Valve. Fig. 18.

Internal Worm and Rack Valve and Column. Fig. 33.

Internal Rack and Pinion Valve and Column. Fig. 20.

Self-Acting Bye-Pass.



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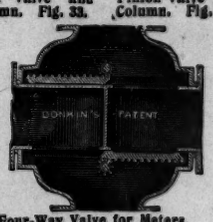

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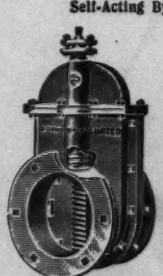

Worm and Rack Valve. Fig. 26.

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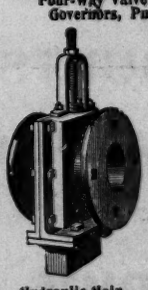
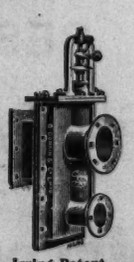


Hydraulic Main Seal Regulating Valve. Fig. 24.



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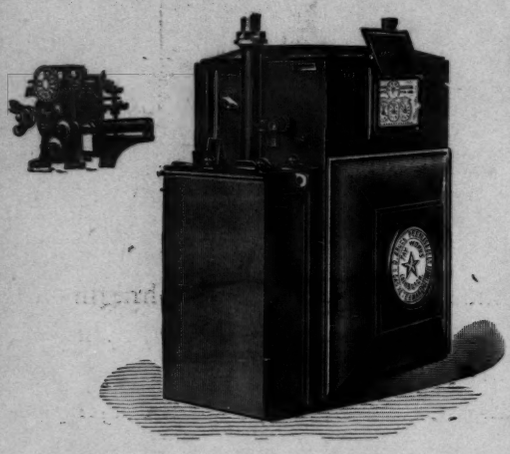

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